

# SOLAR ECLIPSE NEWSLETTER

## SUBSCRIBING TO THE SOLAR ECLIPSE MAILING LIST

**THE SOLAR ECLIPSE MAILING LIST IS MAINTAINED BY THE LIST OWNER PATRICK POITEVIN AND WITH THE SUPPORT OF JAN VAN GESTEL**

### HOW TO SUBSCRIBE:

**IN THE BODY OF THE MESSAGE TO listserv@Aula.com SUBSCRIBE SOLARECLIPSES name, country.**

### The Solar Eclipse Mailing List

The Solar Eclipse Mailing List (SEML) is an electronic newsgroup dedicated to Solar Eclipses. Published by eclipse chaser Patrick Poitevin.

solareclipsewebpages@bopenworld.com

It is a forum for discussing anything and everything about eclipses.

Thanks to the voluntary efforts of Jan Van Gestel of Geel, Belgium, the Solar Eclipse Mailing List (listserv) has been in operation since 10 December 1997. This is the first mailing list devoted solely to topic of solar eclipses on the internet.

You can send an e-mail message to the list server solareclipses@Aula.com, which will then forward your e-mail to all the subscribers on the list. Likewise, you'll receive e-mail messages that other subscribers send to the listserv. Only subscribers can send messages.

## The sole Newsletter dedicated to Solar Eclipses

Dear All,

It was a little catching up this time. Jo is still studying at the University and I was travelling for nearly 3 weeks. Though, I had the opportunity to attend the races in Hong Kong where Happy Eclipse was racing. The horse came out second in the race.

While travelling the server was out for nearly two days as well. No one could receive SE messages. It was my fault and we could correct it.

The SEML was quite busy with some continuing topics. The longest total solar eclipse, eye safety and the filters to use for the partial phases of the solar eclipse. The video of Vanessa was a well discussed topic as well.

But the SEML messages show that the eclipse chasers are nearly ready for the total solar eclipse of 4 December. Most of us leave by the end of this month and we hope to meet you all. Unfortunately, we can not be in South Africa AND Australia.

The program for Totality Day on 8 February 2003 is nearly settled and the first speakers for the International Solar Eclipse Conference (SEC2004) in August 2004 have been agreed. We hope many people will appear. TD2003 is together with Astrotfest, we know, but we hope

many eclipse enthusiasts will combine TD2003 with that event in London.

Due to the long conversations on the SEML, this SENL is quite long, though reduced still in one file. Please enjoy and ... keep those solar eclipse related messages coming ...

All the best for the total solar eclipse and a happy return. Maybe we see you in Milton Keynes for TD2003?

Best regards, Joanne and Patrick

第二場 RACE 2

馬號	馬名	騎師	位位
10	衝線王 B377 WISDOM EXPRESS (NZ) 3 by PPG (2 starts 0-0-0-0-2 HK\$24,500) Woodbury Lad (USA) — Summer Time Blue by Blue Razor (USA) 馬主: 譚怡漢 OWNER(S): Horace Tam Yee Hon	文家良 123 K L Man (47)	鄺雨濤 (5) Y T Cheng
11	首騎士 B357 (B) FIRST KNIGHT (AU) 3 by PPG (3 starts 0-0-0-0-3 HK\$ —) Ascot Knight (GB) — Rose Of St Jude by St Jude 馬主: 八龍龍 OWNER(S): Eight Floor Syndicate	許怡 118 D Hill (42)	鄺迪 (9) D Dunn
12	龍騰勇將 V188 (B/T) HAPPY ECLIPSE (USA) 5 by PPG (32 starts 2-3-2-1-24 HK\$1,110,450) Wins: 1-S 1000 GY, 1-S 1400 G Hazaam — Upwillehorses by Conquistador Chip 馬主: 吳君漢 OWNER(S): Ng Kwai Keung	苗禮德 118 A T Millard (42)	馬安東 (12) A Marcus

RACE TWO  
JACKSON HANDICAP  
RATED 52-92 (Class 4) — 1,000M

Pos	No.	Name	Odds	Win Invest '000	Place Invest '000	Jockey	Wt.	Drw	Win Margin
1	0	Classic Race	8.5sf	1,838	1,402	W. C. Menzies	127	10	SH
2	12	Happy Eclipse	14	814	683	A. Marcus	118	12	1/4
3	10	Wisdom Express	18	671	605	Y. T. Cheng	123	5	1 1/4
4	8	Galile	6.8	1,772	1,190	G. Douze	123	1	1 1/4
5	11	First Knight	84	143	200	D. Dunn	118	6	1 1/4
6	9	Montego Green	2.5f	3,383	2,179	G. Mosen	123	3	1 1/4
7	3	Good Heart	52	290	168	K. C. Tsang	128	7	4
8	5	Lambard	7	1,712	1,478	D. Whyte	128	7	4
9	7	Forecast To Win	6.8	1,783	964	S. Legrie	127	2	4 1/4
10	1	Brow's Honor	71	197	150	W. M. Lal	128	11	7 1/4
11	4	Grasley Junior	7.1	1,698	1,033	H. S. Dye	128	8	7 1/4
12	2	Full Momentum	27	437	488	M. W. Leung	129-7	4	10 1/4

Totals: 14,632 10,604

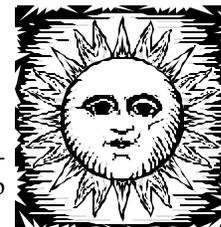
Quinella: Total sales: \$20,966,960  
Sales on winning combination 6x12: \$426,230  
Sales on favourite combination 6x9: \$1,343,160

Time: 0:58.6 (13.1 21.8 23.7)  
Trainer: I. W. Allan

Owner: Yeung Kwok-Id

Course and distance specialists CLASSIC RIZZI and HAPPY ECLIPSE, from gates 10 and 12, respectively, were the quickest pair into stride, were engaged in a nip-and-tuck battle from the outset and it was the former who ran a straight line in the stretch run and held the upper hand at the finish. Happy Eclipse hurt his chances of winning when drifting out sharply at the 260m before staying on strongly. Racing with a ring bit for the first time, WISDOM EXPRESS rated nicely in the middle to and just off the inside and then made good ground late through the middle to make it interesting. He has improved with racing and won't mind a further trip. Prominent in the run, GOLDIE had a ground-saving trip and bumped soon after the line. Bred for a middle-distance, FIRST KNIGHT made good progress late near the inside to make the frame. A tad slow into stride and bumped soon after the brook, the favourite MONTEGO GREEN was hustled to keep a position in midfield and along the inside, drifted out for a run at the 250m and finished evenly. It was a nice debut by GOOD HEART, who made ground late along the inside.

## SECalendar

**November 2002**

Dear All, Please find herewith the solar eclipse calendar (SECalendar) for November. If you have any additional information, queries or remarks, please drop a mail.

For the whole Solar Eclipse Calendar, see <http://solareclipsewebpages.users.btopenworld.com>

November 01, 2282 Three eclipses in one month. 2282 Nov 01 Partial Solar Eclipse, 2282 Nov 16 Total Lunar Eclipse, 2282 Nov 30 Partial Solar Eclipse. (Ref. SEML 06/00)

November 01, 1858 Birth of Gustav von Struve, Russian astronomer. Contributed in statistical astronomy and sun. Same family name of other family members. Died in 1920. (Ref. DD11/99)

November 01, 1905 Minor planet (1967) Menzel A905 VC. Discovered 1905 November 1 by M. Wolf at Heidelberg. Named in honor of Donald Howard Menzel (1901-1976), Harvard astronomer since 1932 and director of the Harvard College Observatory from 1954 to 1966. Both a theoretical and observational pioneering solar and stellar astrophysicist, he calculated atomic transition probabilities, chemically analysed stars and nebulae, and made fundamental contributions to our understanding of physical processes in gaseous nebulae, the solar chromosphere, and interpretation of stellar spectra. He observed 15 solar eclipses, determined spectroscopically the rotation rates of Uranus and Neptune and helped educate a number of prominent astronomers. On the lighter side he is well known for his doodling and for debunking of UFO's. (M 4158) Obituaries published in *Astronomie*, Vol. 91, p. 50 (1977); *Nature*, Vol. 267, p. 189 (1977); *Phys. Today*, Vol. 30, No. 5, p. 96, 98 (1977); *Sky Telesc.*, Vol. 53, p. 244-251 (1977). *Dictionary of Minor Planet Names* - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg

November 01, 1948 The Eclipse Comet only 2 degrees from the Sun and observed during totality in Nairobi, Kenya. Photographed by Robert d' Escourt Atkinson. After, the comet was observed till April 3, 1949 in the southern hemisphere.

November 01, 1982 Death of Dutch astronomer Jakob Houtgast (Assen 1908 - 1982 Utrecht). Houtgast worked on the Observatory of Utrecht, Netherlands and was specialist in the Sun and joined a lot of Solar Eclipse expeditions. (Ref. Heelal 12/82)

November 01, 1994 Launch of Wind (US). Research of Solarwind, together with Polar and Fast. (ref. DD 10/98)

November 02, 1875 Minor Planet (153) Hilda Discovered 1875 November 2 by J. Palisa at Pola. Named in honor of (probably the eldest) daughter of the Austrian astronomer Theodor von Oppolzer (1841-1886) {see planet (1492)}. She died some years prior to her father. (*Vierteljahrsschr. Astron. Ges.*, 22. Jahrg., p. 191 (1887)) Named by Th. von Oppolzer. *Dictionary of Minor Planet Names* - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg.

November 02, 1906 Birth of Bengt Edlen in Gusum in Ostgotland, south eastern Sweden. Ref. *The Bibliographical Dictionary of Scientists*, edited by David Abbott, 1994.

November 03, 1994 Total solar eclipse observed with success by most observers in Chili and Bolivia.

November 03, 2013 Annular-total solar eclipse which will be annular in the beginning and total for the rest of the path. Between 1898 and 2510, there are only a few cases: 3 November 2013, 17 October 2172 and 29 April 2386. Ref. *Canon of Solar Eclipses, 1898-2510* by Meeus, Grosjean and Vanderleen (p. 76).

November 04, 1920 Gustav von Struve, Russian astronomer died. Contributed in statistical astronomy and sun. Same family name of other family members. Born in 1858.

November 04, 1983 Minor Planet (3841) Diccio 1983 VG7. Discovered 1983 November 4 by B. A. Skiff at Anderson Mesa. Named in honor of Dennis di Cicco, since 1974 a staff member and since 1983 an associate editor of *Sky and Telescope*. An

(Continued on page 3)

## SECalendar

imaginative and outstanding astrophotographer, he has participated in many expeditions, specifically to observe eclipses and comets, although his best-known work is probably the analemma showing the Sun from the same spot at the same mean time every few days throughout the year. Particularly meticulous and appropriately cautions in all his writings, he regularly conducts the 'Observers Page' column in the magazine. (M 16246) Citation prepared by B. G. Marsden at the request of the discoverer. Dictionary of Minor Planet Names - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg

November 04, 1988 Minor Planet (5869) Tanith 1988 VN4. Discovered 1988 November 4 by C. S. Shoemaker and E. M. Shoemaker at Palomar. Seen as a heavenly goddess by the conquering Romans who called her Caelestis, Tanith was worshipped by the Carthaginians. This winged sky-goddess of the Punic people wore a zodiac around her head and held the sun and moon in either hand. (M 24918) Dictionary of Minor Planet Names - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg

November 05, 1983 Minor Planet (3744) Horn-d'Arturo 1983 VE. Discovered 1983 November 5 at the Osservatorio San Vittore at Bologna. Named in memory of Guido Horn-d'Arturo (1879-1967), director of the Bologna Observatory for almost half a century and a talented astronomer far ahead of his time. A pioneer in the design and construction of multiple-mirror telescopes, he designed and utilized the world's first such instrument, a 1.80-m zenith telescope at Bologna. In the 1920s he correctly interpreted the shadow-band phenomenon and attributed an important component of stellar scintillation to currents in the Earth's stratosphere. Following a suggestion by Luigi Jacchia {see planet (2079)}, he founded the magazine Coelum in 1931. (M 13178) Dictionary of Minor Planet Names - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg

November 07, 1631 Pierre Gassendi, Wilhelm Schickard, Johannes Hevelius and Johannes Kepler observed for the first time a Transit of Mercury. The two late also predicted the event. Martin van den Hove wrote a book about it. (Ref. DD11/99)

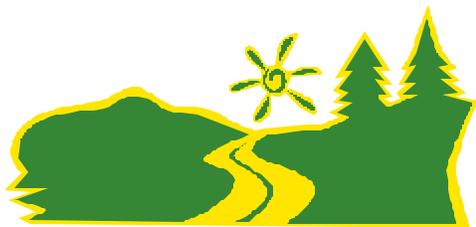
November 07, 1953 Minor planet (1764) Cogshall 1953 VM1. Discovered 1953 November 7 at the Goethe Link Observatory at Brooklyn, Indiana. Named in honor of W. A. Cogshall, professor of astronomy at Indiana University (1900-44). He was known for his work on visual binary stars, photography of solar eclipses, and as a teacher of many who followed professional careers in astronomy. (M 3143) Proposed by F. K. Edmondson. Dictionary of Minor Planet Names - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg

November 08, 1656 Edmond Halley (1656-1742 or 1743) born on November 08, 1656 in Haggerton near London. Famous for his comet but also for his first observations on Baily's beads. The Royal Society also mentioned 29 October 1656. (Ref. Rc1999). Due to the Julian-Gregorian calendar change, the 8th of November 1656 in France was the 29th of October 1656 in England. (Ref. Michel Andre Levy 10/00). Died in Greenwich 14 January 1742. Ref. The Bibliographical Dictionary of Scientists, edited by David Abbott, 1994.

November 09, 1853 Carrington Rotation number 1 starts and initiated by R.C. Carrington.

November 11, 0923 "(This) solar eclipse was calculated and observed by Abu al-Hassan Ali ibn Amajur, who used the al-Zij al-Arabi of Habash . . . We as a group observed and clearly distinguished it . . . We observed this eclipse at several sites on the Tarmah (an elevated platform on the outside of the building) . . . According to calculation from the conjunction tables in the habash Zij the middle was at 0:31 h (i.e. 31 min) and its clearance at 0:44 hours (i.e. 44 min), calculation being in advance of observation." Refers to a solar eclipse of 11 November AD 923. From: Ibn Yunus. Quoted in Historical Eclipses and Earth's Rotation, by F Richard Stephenson, Cambridge University Press, 1997, page 459.

November 11, 1969 Minor planet (2385) Mustel 1969 VW. Discovered 1969 November 11 by L. I. Chernykh at Nauchnyj. Named in honor of Evald Rudolfovich Mustel' {1911-1988}, chairman of the Astronomical Council of the U.S.S.R. Academy of Sciences, editor of the Astronomicheskij Zhurnal, and a vice-president of the IAU during 1970-1976. His research activities involve several aspects of solar and stellar physics and the correlation of geophysical phenomena and solar activity. (M 7617) Obituaries published in Astron. Zh., Tom 65, Vyp. 4, p. 891-892 (1988); Pis'ma Astron. Zh., Tom 14, No. 8, p. 764 (1988); Zemlya Vselennaya, No. 5, p. 42-45 (1988); Astrophys. Space Sci., Vol. 155, No. 1, p. 1 (1989); Sov. Astron. Lett., Vol. 14, No. 4, p. 326 (1988); Sov. Astron., Vol. 32, No. 4, p. 466-467 (1988). Dictionary of Minor Planet Names - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg



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November 12, 1547 Extremely wide path of the annular eclipse of 12 November 1547. The path is 1400 kilometers wide. The northern limit is only a small circle between Normay and Iceland. The paths covers nearly whole Great Britain. (Ref. St L 06/99)

November 12, 1891 Birth of Seth B. Nicholson, American Astronomer. His main task was observing the sun. He published yearly, and for decades, reports about sunspots and magnetic fields. He died in 1963. (Ref. DD11/99)

November 12, 1966 On November 12<sup>th</sup> 1966 total solar eclipse, Gemini 12 astronauts Lovell and Aldrin saw the eclipse from orbit and they saw the moon shadow on earth surface. For them totality lasted only 6 sec. Lift-off of Titan booster have been synchronized in order to intercept that total eclipse that was visible from south America. (Ref. PA07/98)

November 12, 1985 Total solar eclipse on the Antarctic and of which the northern limit was more to the south then the southern limit of the eclipse.

November 14, 1659 In Chapter VII of "A Handbook of Solar Eclipses" by Isabel M. Lewis which was written in advance of the 1925 eclipse over NE USA, Lewis identifies the eclipses of November 14, 1659, August 22, 1672, July 12, 1684 (AT), and January 19, 1768 (AT) as having occurred in the years that elapsed since the Pelgrim fathers landed in New England. (Ref. ENB012)

November 17, 1183 ". . . the Minamoto army fled, frightened by a solar eclipse." Refers to an annular eclipse of 17 November 1183. From: Gehpei seiseiki (Japanese history of the Minamoto and Taira clans). Quoted in Historical Eclipses and Earth's Rotation, by F Richard Stephenson, Cambridge University Press, 1997, page 266.

November 20, -0128 (129 BC) "Hipparchus tries to demonstrate the Moon's distance by gues sing at the Sun's. First he supposes that the Sun has the least perceptible parallax, in order to find its distance, and then he uses the solar eclipse which he adduces; at one time he assumed that the Sun has no perceptible parallax, at another that it has a parallax big enough [to be observed]. As a result, the ratio of the Moon's distance came out different for him for each of the hypotheses he put forward; for it is altogether uncertain in the case of the Sun, not only how great its parallax is, but even whether it has any parallax at all." From: Ptolemy, Almagest, V, 11. "So Hipparchus, being uncertain concerning the Sun, not only how great a parallax it has but whether it has any parallax at all, assumed in his first book of 'On Sizes and Distances' that the Earth has the ratio of a point and centre to the Sun [i.e. the Sun's sphere]. And at one time using the eclipse he adduced, he assumed that it had the least parallax, and at another time a greater parallax. Hence the ratios of the Moon's distances came out different. For in Book 1 of 'On Sizes and Distances' he takes the following observation: an eclipse of the Sun, which in the Hellespontine region was an exact eclipse of the whole Sun, such that no part of it was visible, but at Alexandria in Egypt approximately four-fifths of the diameter was eclipsed. By means of the above he shows in Book 1 that, in units of which the radius of the Earth is one, the least distance of the Moon is 71, and the greatest 83. Hence the mean is 77. . . Then again he himself in Book 2 of 'On Sizes and Distances' shows from many considerations that, in units of which the radius of the Earth is one, the least distance of the Moon is 62, the mean 67-1/3 and the Sun's distance 490. It is clear that the greatest distance of the Moon will be 72-2/3." From: Pappus, Commentary on the Almagest "Moreover, such an observation has been made in the case of an eclipse of the Sun. Once the Sun was wholly eclipsed in the Hellespont, it was observed in Alexandria to be eclipsed except for the fifth part of its diameter, which is, according to the sight, except for two digits and a little more. . . Now since it is 5000 stades from Alexandria to Rhodes; besides, proceeding hence to the Hellespont, this will also decrease in proportion, since when the Hellespont is reached, it will entirely vanish." From: Cleomedes, De Motu Circularis Corporum, II, 3. These three quotations probably refer to a total solar eclipse of 20 November 129 BC. Quoted in Historical Eclipses and Earth's Rotation, by F Richard Stephenson, Cambridge University Press, 1997, page 351.



November 22, 1972 Launch of ESRO 4 (ESA), studied atmosphere and solarwind. (Ref. DD11/99)

November 22, 1944 Arthur Stanley Eddington died in Cambridge. Ref. The Bibliographical Dictionary of Scientists, edited by David Abbott, 1994.

## SECalendar

November 22, 1984 Total solar eclipse in a part of New Guinea and only 18 lunations (1 ½ year) after the total solar eclipse of 11 June 1983 which was also visible from that part. One Saros later on 21 June 2001 and 4 December 2002 a small part of Angola will witness a total solar eclipse. (Ref. JM09/99)

November 24, 0029 "And Phlegon also who compiled the Olympiads writes about the same things in his 13th book in the following words: 'In the fourth year of the 202nd Olympiad (AD 32-33), an eclipse of the Sun took place greater than any previously known, and night came on at the sixth hour of the day, so that stars actually appeared in the sky; and a great earthquake took place in Bithynia and overthrew the greater part of Niceaea.'" Possibly refers to a total solar eclipse of 24 November AD 29, the reference to AD32-33 being incorrect. From: Phlegon, Olympiades, fragment 17. Quoted in Historical Eclipses and Earth's Rotation, by F Richard Stephenson, Cambridge University Press, 1997, page 359.

November 24, 0029 "I will show portents in the sky and on earth, blood and fire and columns of smoke; the sun shall be turned into darkness and the moon into blood before the great and terrible day of the Lord comes." Joel, Chapter 2, verses 30, 31 (Old Testament). "And I will show portents in the sky above, and signs on the earth below - blood and fire and drifting smoke. The Sun shall be turned to darkness, and the moon to blood, before that great, resplendent day, the day of the Lord, shall come." Peter in Acts of the Apostles This reference to a blood-red Moon, and the following references in the Gospels to a darkening sky, have been interpreted as placing the date of the crucifixion to 24 November AD 29, when there was an eclipse of the Sun, or Friday, 3 April AD 33, when there was a partial eclipse of the Moon over Jerusalem. Ref FE 01/01

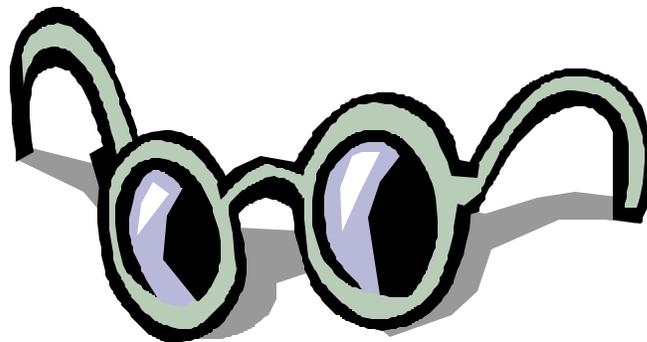
November 24, 1989 Solar Maximum Mission (SMM - US) stopped. Performed 9 years observations of the sun. In 1984 in de shuttle repaired. (ref. DD11/99)

November 25, 1995 The first DDD (De Duistere Dag or The Dark Day), organized by the Solar Eclipse Section (Patrick Poitevin), VVS Belgium in Volkssterrenwacht Mira in Grimbergen, Belgium. Speakers where Jean Meeus (triangles and eclipses), Felix Verbelen and Anton Vollemaere (Codex: Eclipses and Maya's) and Patrick Poitevin (Eclipse November 03, 1995).

November 28, 1883 Minor Planet (235) Carolina Discovered 1883 November 28 by J. Palisa at Vienna. Named for an atoll of the Line Islands, 450 miles northwest of Papeete, Tahiti, where the discoverer observed the solar eclipse of May 6, 1883. Palisa observed the solar neighborhood in order to find an intra-Mercurian planet. (H 28) Named by the discoverer (BAJ Circ., No. 218 (1883)) in remembrance of his voyage to this island. Dictionary of Minor Planet Names - ISBN 3-540-14814-0 - Copyright © 1999 by Springer-Verlag Berlin Heidelberg

November, 1996 First issue of the Eclips Nieuwsbrief (Eclipse Newsletter). Monthly magazine of the Solar Eclipse Section, VVS Belgium. Editor and founder Patrick Poitevin. Patrick continued the SENL (Solar Eclipse Newsletter) after leaving the Solar Eclipse Section and edited the SENL with partner Joanne Edmonds. The SENL issues can be downloaded (free of charge) from the webpages of Fred Espenak.

and ... keep those solar eclipse related messages coming ... Best regards, Patrick and Joanne solareclipsewebpages@btopenworld.com <http://solareclipsewebpages.users.btopenworld.com>



## SEDates

### French national "astronomy" convention

From: Jean-Paul GODARD To: SOLARECLIPSES@AULA.COM Date: Thu, 24 Oct 2002 03:54:48

"Rencontres du ciel et de l'espace" (Meeting about Sky and Space) is the "French national astronomy" convention" and will take place on November 9,10,11 in Paris 'Cite des sciences" (We do not work on 11/11 in France)

Detailed program can be found at <http://www.cieletespace.fr/front/rce2002/ateliers.asp>

Eclipse chasers should note:

Sun 10/11 11:00 "Un moment d'obscurité" Film from Jean Mouette about TSE20010621 in Angola

Sun 10/11 13:45 "Eclipse au Zimbabwe" Film from JP Godard and Martine Tlouzeau about TSE20010621 in Zimbabwe

Sun 10/11 15:45 " La photographie des eclipses" talk from Herbert Hansen

Sun 10/11 16:45 "La zambie pour une eclipse" Talk from Jean-Marie Vugnon

More details (in french) can be found at <http://www.cieletespace.fr> Entrance fee 5 to 10 euros according to the number of days



*Drytac launches Printable Eclipse, a new 100% backing film for superb banner graphics*

**Publicity about Eclipse packaging**

## SEScannings

### E-mail address change

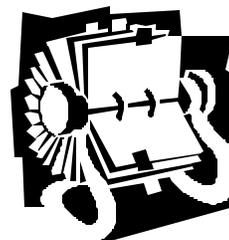
From: solareclipsewebpages@btopenworld.com To: SOLARECLIPSES@AULA.COM eclipse@hydra.carleton.ca  
Date: Sun, 06 Oct 2002 21:06:14

Dear All, Please note that our hotmail account is no longer in use. Please make a note of our new e-mail address and webpage.

Make sure your files, webpages and addressbooks are correct. Thank you.

solareclipsewebpages@btopenworld.com  
<http://solareclipsewebpages.users.btopenworld.com>

Best regards, Patrick and Joanne Poitevin



### New book(let) on TSE2002

From: F.Podmore To: Solar Eclipses Mailing List <solareclipses@aula.com> Date: Mon, 28 Oct 2002

I think some of you on SEML want to collect every book there is about solar eclipses... Well recently I saw the following:

Southern Africa's 2002 Eclipse: The Day the Moon ate the Sun

by Kim Curtis and Brian Jones

published 2002 by 'amaBooks  
P.O. Box 9160 Bulawayo Zimbabwe  
email: amabooks@yahoo.co.uk

ISBN 0-7974-2514-0

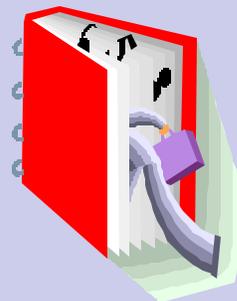
It has 6 plus 22 pages, with maps (taken from Astronomical Society of Canada Observer's Handbook 2002, but originally from Espenak&Anderson NASA TSE bulletin or website, I suspect), some photographs and a 2-page listing of Local Circumstances for various southern African sites.

The local cost in the bookshop is ZimDollars 1150, which translates to about US\$22 and UKP 14 at the 'official' bank exchange rate, but less than USD 1.5 or UKP 1 at the current so-called 'parallel market' rate!!!

I'm sure for most people it would be easiest to order from amazon.com or equivalent, but if any of you would like me to buy and post one to you, then let me know off-list. And we can come to some arrangement to cover cost of purchase and posting. Make me an offer....

And I am fairly sure there will be equivalent publications in South Africa, in addition to Cliff Turk's book.

For Peter Tiedt: Are there? Perhaps you could post details for the umbralibraphiles out there. Francis



## SEScannings

### SENL Index October 2002

Dear all, Please find herewith the Index of the October 2002 issue of the Solar Eclipse Newsletter (SENL). Beside the topic, the page number is listed.

#### Part A

pages 1 to 30 ... / ...

#### Part B

pages 31 to 54 ... / ...

See the latest SENL and also the complete SENL Index since November 1996 at

<http://solareclipsewebpages.users.btopenworld.com>

The SENL will be soon on the WebPages of Fred Espenak/NASA. See

<http://sunearth.gsfc.nasa.gov/eclipse/SENL/> and the index at

<http://www.mreclipse.com/SENL/SENLinde.htm> with example: [SENL0011.pdf](http://www.mreclipse.com/SENL/SENL0011.pdf)

<http://sunearth.gsfc.nasa.gov/eclipse/SENL/SENL0011.pdf>

Comments and contributions are welcome at [patrick\\_poitevin@hotmail.com](mailto:patrick_poitevin@hotmail.com)

And ... keep those solar eclipse related messages coming ...

Best Regards, Patrick and Joanne

[solareclipsewebpages@btopenworld.com](mailto:solareclipsewebpages@btopenworld.com)  
<http://solareclipsewebpages.users.btopenworld.com>

### Scannings in October issues

From: [solareclipsewebpages@btopenworld.com](mailto:solareclipsewebpages@btopenworld.com) To: SOLARECLIP-SES@AULA.COM Date: Mon, 07 Oct 2002

#### Scannings in October issues

##### 1. Journal of the British Astronomical Association

The Transit of Mercury on 2003 May 7 by Peter Macdonald (page 244)

see <http://www.britastro.org/journal/>

##### 2. Sky & Telescope

Astronomy in the Land of the Aztecs by Francisco Javier Mandujano Ortiz (pages 66 to 69 - including solar eclipse related accounts)

Shelter from the Storm by E. C. Krupp (pages 78 to 80 - including solar eclipse related accounts)

Gallery: Hydrogen Alpha Sun by Giovanni A. Quarra Sacco (page 120), Crescent Sun by Thorir G. Fienberg (page 122)

see [SkyandTelescope.com](http://SkyandTelescope.com)

##### 3. Astronomy

The Last Minute Eclipse by Jose Luis Cuellar Cuevas (pages 101 to 102)

Hot shots: Partial Solar Eclipse by Robert B. Slobins (page 102)

see <http://www.astronomy.com>

##### 4. Astronomy Now

500th SOHO comet found by PB (page 10)

Watching the weather in space by Neil Bone (pages 59 to 61)

AstroListings with solar eclipse related meetings on 11 October, 16 October, 25 October and 30 October (pages 81 and 82)

Picture Gallery: Hydrogen Alfa by Jeffrey Pettitt (page 84)

see <http://www.astronomynow.com>

Best regards, Patrick



## SETalk

**Spencer Jones Bio**

From: Brian Whatcott To: HASTRO-L@LISTSERV.WVU.EDU Date: Sat, 12 Oct 2002 22:57:30

Here's a brief bio, and the URL where it can be found. Brian W

Spencer Jones, Harold (1890-1960) English astronomer who made a determination of solar parallax, using observations of the asteroid Eros. He also studied the speed of rotation of the Earth, and the motions of the Sun, Moon, and planets. Spencer Jones was born in London and studied at Cambridge. He worked at the Royal Observatory, Greenwich, 1913-23; was His Majesty's Astronomer on the Cape of Good Hope, South Africa, 1923-33; and ended his career as the tenth Astronomer Royal 1933-55. While at the Cape of Good Hope, Spencer Jones published a catalogue containing the radial velocities of the southern stars, calculated the orbits of a number of spectroscopic binary stars, and made a spectroscopic determination of the constant of aberration. In 1925, he obtained and described a long series of spectra of a nova which had appeared in the constellation of Pictor. Spencer Jones proved that fluctuations in the observed longitudes of the Sun, Moon, and planets are due not to any peculiarities in their motion, but to fluctuations in the angular velocity of rotation of the Earth. He also investigated the Earth's magnetism and oblateness, and he estimated the mass of the Moon.

<<http://www.cartage.org.lb/en/themes/Biographies/MainBiographies/S/Spencer/1.html>>

At 02:16 PM 10/12/02, you wrote: Should have checked Joe Tenn's site first; HSJ = Harold Spencer Jones. Tnx Joe, once again. g

Brian Whatcott Altus OK Eureka!

**New CORONAS project site opened**

>From <kvd@izmiran.rssi.ru> 14 Oct 2002

The Russian-Ukrainian satellite CORONAS-F launched on July 31, 2001, continues observations of the Sun. The scientific payload of the mission comprises four main groups of instruments:

1. Helioseismology
  - o Spectrophotometer DIFOS (PI - V.N.Oraevsky)
2. Monochromatic Imaging with a High Angular Resolution
  - o Solar X-Ray Telescope SRT-K (PIs - I.I.Sobelman and I.A.Zitnik)
  - o X-Ray Spectroheliograph RES-K (PIs - I.I.Sobelman and I.A.Zitnik)
  - o Spectrophotometer DIOGENESS (PI - J.Sylwester)
3. Electromagnetic Fluxes and Polarization Measurements (from UV to IR)
  - o X-Ray Spectrometer RESIK (PI - J.Sylwester)
  - o Solar Spectropolarimeter SPR-N (PIs - I.I.Sobelman, I.P.Tindo, and S.I.Svertilov)
  - o Flare Spectrometer IRIS (PI - G.E.Kocharov)
  - o Gamma Spectrometer HELIKON (PI - E.P.Mazets)
  - o X-Ray Spectrometer RPS (PIs - V.M.Pankov and Yu.D.Kotov)
  - o Amplitude-Time Spectrometer AVS (PI - Yu.D.Kotov)
  - o Solar UV Radiometer SUFR-Sp-K (PI - T.V.Kazachevskaya)
  - o Solar UV Spectrophotometer VUSS-L (PI - A.A.Nusinov)
4. Study of Solar Corpuscular Fluxes SCR Complex (PI - S.N.Kuznetsov)
  - o Gamma-Ray and Neutron Spectrometer SONG
  - o Cosmic Ray Monitor MKL
  - o X-Ray Spectrometer SKI-3

Information on the CORONAS-F data access is available on the new CORONAS project Web site <http://coronas.izmiran.rssi.ru>

**Delta T**

From: Jean Meeus Date: Thu, 03 Oct 2002 11:04:15

On 2002 September 1, the value of Delta T was 64.41 seconds, the same as on August 1 and on July 1.

Delta T is the difference between the uniform Dynamical Time and the Universal Time. Jean Meeus



## SETalk

**Eclipse! in German**

Date: Thu, 3 Oct 2002 From: Phil Harrington <PHARRINGTON@compuserve.com> To: "INTERNET: eclipse@hydra.carleton.ca" <eclipse@hydra.carleton.ca>

All, Pardon a bit of shameless self-promotion, but I am happy to announce that my book Eclipse!, published in 1997 by John Wiley & Sons, has recently been translated into German and republished as "Sonnen- und Mondfinsternisse beobachten." This edition joins the Chinese and Polish editions (and English, of course), which were previously published. The German edition is released through Spektrum Akademischer Verlag in association with Stern und Weltraum magazine. For reference, its ISBN number is 382741329X. Thanks, Phil Harrington

**Eclipse painting by Raffaello?**

From: Dr. Wolfgang Strickling To: SOLARECLIPSES@AULA.COM Date: Sun, 20 Oct 2002 20:22:34

Hello in the list, a visitor of Rome told me, that there is a painting of a solar eclipse of Raffaello or one of his pupils in the the Vatican Museum. It can be found in the "Raphael Loggia" (the "Raffaello Bible") in the 10th arch. You can download a picture from <http://www.christusrex.org/www1/stanzas/L37-Loggia.html> under Nr 39 - Joshua stops the Sun. It is surprig, that right of the black sun the lunar crescent is to be seen, although in an astronomic wrong orientation. Dose anyone know more about this painting and its astronomic background? The paintings were made from 1517 to 1519 AD. The last total eclipse before this date near Rome was on 1431-Feb-12, on 1518-Jun-08 there was an annular eclipse (94% diameter), so one of the artits hardly witnessed a total solar eclipse. Best regards Dr. Wolfgang Strickling Germany Dr. Strickling@gmx.de

**ECLIPSE PROBLEM**

Date: Thu, 03 Oct 2002 From: wnowak <wnowak@interlog.com> To: eclipse@hydra.carleton.ca

As we all know the maximum duration of the eclipse on our planet is equal 7 min.31 sec. This is the value for the equator I believe. My question is; what is the mathematical formula for the maximum duration for a given latitude ? Alternately, maybe most of the values were calculated by somebody and published somewhere.

**Olympic Countess - Durban**

From: Gerard M Foley To: SOLARECLIPSES@AULA.COM Date: Thu, 10 Oct 2002 17:21:43

Would anyone planning to join the Olympic Countess at Durban please e-mail me?

Gerry  
<http://home.columbus.rr.com/gfoley>  
<http://www.fortunecity.com/victorian/pollock/263/egypt/egypt.html>

From: Gerard M Foley

Sorry about omitting my e-mail address:  
[gfoley@columbus.rr.com](mailto:gfoley@columbus.rr.com)

From: Gerard M Foley

The Olympic Countess is intending to be on the center line of the TSE of December 4, 2002. There are certain questions about vaccinations which I wish to discuss, off list, with persons who are going on the trip.

I have seen a fair number of messages concerning land arrangements to see this eclipse. I'm sorry if observations at sea are off topic.

Gerry <http://home.columbus.rr.com/gfoley> <http://www.fortunecity.com/victorian/pollock/263/egypt/egypt.html>

**SEML back on track**

From: solareclipsewebpages@bopenworld.com To: SOLARECLIPSES@AULA.COM Date: Thu, 17 Oct 2002 00:34:03

Dear All, There have been some problems with sending SEML messages. We are back on track. My excuses that the SEML facility was not working for over 24 hours. Mea culpa.

And ... please keep those solar eclipse related messages coming ...  
 Best regards, Patrick



## SETalk

**Maximum theoretical duration of the total eclipse**

From: solareclipsewebpages@btopenworld.com To: SOLARECLIPSES@AULA.COM Date: Mon, 14 Oct 2002 12:06:57

On behalve of Albert Nowak, Canada

Is it possible that so far nobody analysed the maximum theoretical duration of the total eclipse for a given geographical latitude ? "Mr. Eclipse" does not know that, because I asked him directly a year ago. I hope that somebody else knows. Maybe at least somebody calculated the maximum latitude for 7 min. eclipses, 6 min. eclipses 5. min eclipses. I hope that this question is strictly "on the line" of the SEML. You can post it yourself, if you prefer. Sincerely, Albert.

From: wnowak

Dear Sir, I assume that nobody is going to answer my question, whatever is the reason. So, I decided to calculate it myself. I almost could not believe it.

7 min. 31 sec. is not the value of the longest possible eclipse on our planet. I wonder who "invented" it, and based on what assumptions. Maybe you know. Maybe you can ask, I bet that they will answer your question. Sincerely, W. Nowak.

From: rybrks1@cs.com

The SEML discussed this at length last year. I will look up the SENL issue when I return home tomorrow and forward the info. I believe it was a Dr Isabella Lewis that presented a paper in 1928 to the USNO ?? She had the duration correct even though she was using a larger k value for Moon diameter than currently adopted because she placed the site on the equator. The optimal site is really north 4.31 latitude (if I recall correctly..I will forward it per above)

Initially I thought it was greater than 7:31 also. I even found a reference in the Encyclopedia Britannica stating 7:41. The mistake that I had made was placing the Moon closer to Earth in July than is possible. Closest possible perigee is in January not July. Ray Brooks

From: Peter Tiedt

Jean Meeus has confirmed that 7m31s is the longest - the answer is covered in detail in one of the Morsel books

The detailed explanation can be found on pp 113- 114 of "More Mathematical Astronomy Morsels", and Jean confirms the findings of Isobel Lewis. Peter Tiedt rigel@stars.

co.za Visit my website at <http://www.eclipse.za.net>

From: wnowak <wnowak@interlog.com>

I will try to prove ( with almost no mathematics ) that the eclipse can be longer than 7 min. 31 sec.

Please look at 2186 July 16th, the current record holder. It will "score" 7 min. 29 sec. It is only 2 seconds shorter than the theoretical maximum value then. Are all its component values close to perfection ? I do not think so. For example the eclipse magnitude value is equal 1.080. There are other long eclipses that have higher value equal 1.082. So, we are far from perfection. How far ? As far as  $1 - 0.080/0.082$ , and this is equal 2.5%. This can be directly translated to the time of the eclipse, since the bigger the relative size of the disk of the Moon in comparison to the disk of the Sun, the longer the eclipse. So we are talking about possible additional 2.5% of time, and this is more or less  $0.025 * 7.5 = 11$  seconds.

Can perfect perigee meet perfect aphelion ? I would say yes. It is just a matter of time. Within one precession cycle, the date of the aphelion will get slowly shifted, and finally it will position itself somewhere in the area of the best perigees.

I must have made a mistake, right ? Where is it then ? W.A. Nowak.

From: Jean Meeus

The eclipse with the largest ratio Moon/Sun diameters in recent times that I found was 1.080, at the eclipse of 1991 July 11.

For what eclipse did you found a ratio of 1.082?

Chapter 17 of my recent book "More Mathematical Astronomy Morsels" (Willmann-Bell, 2002) is about total solar eclipses of long duration. There the list is given of all total eclipses with a duration longer than 7 minutes between the years 0 and 4000. It appears that during these 40 centuries the longest totality is that of the eclipse of 2186 July 16 : 7 minutes and 29 seconds. There I also discuss the assumption made by Mr. Raymond Brooks in March 2001. He too presumed that the maximum possible duration would be about 7 minutes and 40 seconds. However: it appears that we never can have the Earth near aphelion and the Moon at an extreme perigee simultaneously !

Remark. -- The \*ratio\* of the lunar diameter to the solar diameter is called "magnitude" by some authors, but it is

(Continued on page 12)

## SETalk

not really a "magnitude". It is a ratio. (But that is another question!). Jean Meeus

From: wnowak

Dear Sir, I would appreciate if you could post my message exactly as it is written. Sincerely, Albert.



\*\*\*\*\*

Close to our times the eclipse July 5th 2168 seems to have ratio = 1.081. The eclipses with ratio as high as 1.082 happened only three times from 3000 B.C. to 5000 A.D..

Apr. 25th -2266 ( 7 min. 10 sec. ), perigee = 357 365 km.  
 May 5th -2248 ( 7 min. 20 sec. ), perigee = 357 426 km.  
 May 17th -2230 ( 7 min. 21 sec. ), perigee = 357 503 km.

One would expect these perigees to be "extremely good". The perigee value can go as low as 356 3XX km, so these perigees are not "very good". How come that ratios were as high as 1.082 then ?. Eclipses took place very close to aphelion dates ( May and not July, because of precession ), plus the moment of the eclipse took place close to the moment of the perigee. How close ? This close: -2266 2 hours, -2248 5 hours, -2230 8 hours. Sure, the error can be present ( more in timing, than in ratio ! ), since eclipses took place 4000+ years ago.

Please remember that the distance to the Moon changes by 1000 km for every 6-8 hours. So it is important for the eclipse to take place as close to the perigee time as possible. We do not need extremely good perigee ( < 357 300 km ) in order to have a very long eclipse.. All we need is a reasonably good perigee ( 357 300 km > x > 358 200 km ), but the timing must be perfect, and timing is more or less random (!).

Indeed it looks like the best perigees ( < 357 300 km ) are always around 5-7 months from the aphelion date. ( eclipse date close to aphelion date is a "sine qua non" condition for a very long one to happen). Even within one precession cycle they move together with aphelion date. So, in spite of the theoretical possibility of ratio as high as 1.083, this never happens. The best perigees ( < 357 000 km ) are simply not "reachable" for potentially long total eclipses.

I performed a simple statistical analysis for all 56 calculated eclipses with duration > 7 min.. Here are the results :

1. Perigee distance was always more than 357 292 km, and less than 358 242 km.
2. The eclipse takes place always less than 19 hours before or after the perigee, with average value equal 6.8. Only four times the "hit" was perfect ( 0 hours ). This happened for eclipses: -2548, -1124, 381, 2186.

In my previous message that I posted, I tried to shake a bit the "dogma" of 7 min. 31 sec. max. duration. Now, with another example of a real eclipse I will try to seal the sarcophagus of the "7&31 dogma".

I will use the eclipse of June 15th -743. It was 7 min. 28 sec. long. and very close to equator ( 0.4S ), with ratio = 1.079.

Now, please take a look at the page ( I take all data for perigees from here ).

\*\*\*

<http://www.fourmilab.ch/earthview/pacalc.html>

\*\*\*

One can find there that this particular eclipse took place 7 hours before the perigee, and we can also see there that the value of the perigee is equal 357 464 km. If the eclipse took place during the perfect perigee time ( 0 hours ), the Moon would have been closer to the Earth by about 1000 km. As a result the disk of the Moon, could have been bigger in the sky by additional factor around  $(1 + 357) / 357 = 1.003$ . The eclipse ratio would be equal  $1.079 * 1.003 = 1.082..$  This would be the "depth" of the eclipse providing that the eclipse took place perfectly at perigee time ( 0 hours ). As a result the eclipse would be longer by at least 10 seconds, and of course 7 min.28 sec. + 10 sec. = 7 min. 38 sec..

(Continued on page 13)

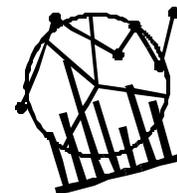
## SETalk

Is there anybody left with arguments for defence of the "7&31 dogma" ? Maybe the data ( authorized by F. Espenak ) that I have used is incorrect ?

I believe that I have just sealed the sarcophagus of the "7&31 dogma" FOREVER.. W. A. Nowak.

From: Jean Meeus

This is a reply to Mr Nowak.



(1) He writes that at the eclipse of 2168 July 5 the Moon/Sun ratio will be 1.081. This is correct.

(2) On the other hand, it is evident that the stated value of 7 minutes 31 seconds as the maximum possible duration of a total solar eclipse is valid only for modern times, say around the 20th century, not for many millennia, not at the era of the dinosaurs. Indeed, the eccentricity of the Earth's orbit and the longitude of its perihelion slowly vary with time. That eccentricity is now 0.01671, but at some epochs in the very past or in the far future the orbit was (will be) almost exactly circular, and at other times the eccentricity can be as large as 0.06. It is evident that at those epochs the situation is completely different from the present one.

(3) Mr Nowak writes that at the eclipses of -2266, -2248 and -2230 the ratio was as high as 1.082. This is possible. I didn't check it. However, those eclipses took place 42 centuries ago, when the eccentricity of the Earth's orbit was larger than presently :

year +2000  $e = 0.01671$

year -2200  $e = 0.01824$

Therefore, 42 centuries ago the aphelion distances of the Earth were somewhat larger than the present values, resulting in a smaller solar disk, and hence a somewhat larger possible value for the ratio. But, again, that was 42 centuries ago.

(4) Mr Nowak writes that the Earth-Moon distance changes by 1000 km for every 6-8 hours. However, this is true only about midway between perigee and apogee. Then the variation of the distance is greatest. For example, on 2002 September 15,

at 0h Dynamical Time, distance = 385563 km

at 7h Dynamical Time, distance = 386975 km

or a variation of 1412 km during only 7 hours.

But Mr Nowak forgets that near perigee (and near apogee) the Earth-Moon distance varies very slowly. He writes that at the eclipse of -743 June 15, if the Moon would have been exactly at perigee instead of being 7 hours from it, the Moon would have been closer to the Earth by about 1000 km. This is incorrect. I performed a calculation by means of Chapront's ELP lunar theory, and I found the following values for the distance between the centers of Earth and Moon. The times are in Dynamical Time:

-743 June 15 14h distance = 357545 km (7 hours before perigee)

-743 June 15 21h distance = 357465 km (perigee)

-743 June 16 04h distance = 357550 km (7 hours after perigee)

So, during the 7 hours from perigee, the distance changed by less than 100 kilometers (ONE HUNDRED km), not by about 1000 km as stated by Mr Nowak, and this renders his argumentation invalid.

The 7&31 "dogma" is not yet dead, but still alive and well! Jean Meeus

From: Rybrks1@cs.com

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## SETalk

Here is a discussion written April 2001. Please note the next to last paragraph: I agree that to inspect eclipses far into the future when Earth orbit eccentricity has evolved would be changing the rules of the game and not a fair attack on the 7:31 issue.

Also focus on the mid-paragraphs: To expect the absolute closest perigee at new moon in order to fabricate a superlong eclipse intuitively does not make sense—the Sun pulls the new moon away from Earth, it does not push on it; very far apogees at new moon make sense that result in a close perigee 2 weeks later at full moon not vice versa. The sun's static field is slightly more than one percent stronger at apogee new moon versus perigee full moon. Thus very close perigees at full moon make sense as a result of the preceding far apogee new moon. Absentmindedly ignoring that to "design" a long TSE has me now shaking my head in both annoyance and amusement. Headstrong to "prove" a point.

Email sent April 2001 Epilogue - Longest Total

Let me tidy things up about the issue of longest total solar eclipse TSE duration being 7:31.

Stepping back: The Moon is not really in orbit around the Earth, it is in orbit around the Sun; the Moon always tracing a concave curve about the Sun. If we stopped the solar system orrery and pinned the Sun, Moon and Earth to the construction paper of space and then unpinned only the Moon (with new moon between Earth & Sun) it would accelerate to the Sun, not to Earth! The sun is the key player. The sun's gravity field is 2.2 times stronger on the Moon than is Earth's gravity field (at 240,000 miles). Tides are mostly lunar because the Sun pulls almost equally on the near and far sides of Earth—since they are basically the same distance from the Sun. The near and far sides of Earth are more than 3.6% different distances from the perigee moon, 7.4% differential moon field strength;  $1/r$  squared.

Analogy: the Sun whirls a little red wagon around—with the Earth and Moon just secondarily dancing with each other while they ride on the wagon. (To me that is the biggest statement that Earth did not capture the Moon—to design a capture takes extremely tight parameters)

So my question last week (which should have keyed me back to reality), "Is there some kind of solar system harmonic that would preclude close (TSE) perigees (as opposed to the more common mediocre perigees) from occurring during or near aphelion?" was pertinent but the answer was straightforward, one harmonic is Earth aphelion/perihelion itself and the other harmonic is the monthly swing of the Moon (more below). The sun again is the key player. (the

Woody Allen movie scene of him slapping his own forehead regretfully comes to mind)

This aspect of the bodies really being in orbit about the Sun also plays into launches from Earth to the Moon and helps me to somewhat understand the Moon's motion. I recall 40 years ago surreptitiously being crouched in the corner of the locker room in prep school (radios were forbidden) with a tiny Japanese (was it 6-transistor?) 9 volt radio listening to moon Surveyor landings - not understanding why the spacecraft got captured so early by the Moon with one-sixth of the trip still remaining versus only one-ninth. After all, the Moon is 81 times lighter than Earth and 9 squared is 81. (at 240,000 miles distance the static balancing point between Earth & Moon is 216,000 miles from Earth, between Earth & sun is 161,000 miles from Earth, between sun & Moon 18,000 miles from the Moon) Capture by the Moon of satellites occurs at about 200,000 miles from Earth, not at the 216,000 mile marker.

I believe the reason is: with the Earth-Moon lil'-red-wagon orbital trajectory really being a tangential free fall toward the Sun, the Surveyor (or Apollo) was also freefalling toward the Sun but timed so that it essentially intercepted the Moon on its way in. Again, the Sun is the key player. (Earth 18 miles per second tangent to orbit, Surveyor initially 7 miles per second radially (basically) inward.) Most of the nine Apollo missions to the Moon's neighborhood (3 did not land) were launched shortly after new moon, so they moved generally toward the Sun. The point is the Sun is running the show from a location of about 161,000 miles out and 'capture' by the Moon is a combination of the Sun's gravity field and the Moon's field and the centripetal force of the satellites trajectory.

Now back to the Earth-Moon system: keeping in mind the dominating effect of the Sun, how do you get a very close lunar perigee to Earth (from an orbital mechanics viewpoint)?—just start with a very far apogee on the opposite side of the lunar orbit. How to get an extreme far apogee?—put the Moon nearer the Sun so it is pulled most from Earth, meaning new moon. The extreme apogees do occur at new moon. Almost makes you wonder how there can be an apogee at Full Moon; well, a Full Moon is a "New Earth" which is that time of the lunar month when Earth is nearest the Sun and in a sense can be pulled away from the Moon causing apocynthion (max distance from the Moon). New Earth is a much smaller effect than New Moon since the barycenter is inside Earth.

Jean Meeus' reply stating the closest perigee is Jan 1 2257 immediately prompted the thought, "Makes sense, and I bet it's a Full Moon." Sure enough, Full Moon is only 23 min-

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## SETalk

*(Continued from page 14)*

utes later, a third of a moon diameter later. The apogees (near new moon) 2 weeks before and after that perigee full moon are very near the maximum apogee values. And I assume if we had God's computer, the computed corresponding value for apogee at the instant of the actual minimum perigee would be maximal. The plot that Guy Ottewell shows in his yearly calendar of the Moon's 'rubber-banding' in and out illustrates that nicely and makes it plain that the close perigees are near January (perihelion) and near full Moon. To expect (which was my implied critically faulted expectation) the absolute closest perigee at new moon in order to fabricate a superlong eclipse intuitively does not make sense—the Sun pulls the new moon away from Earth, it does not push on it; very far apogees at new moon make sense that result in a close perigee 2 weeks later at full moon not vice versa. The sun's static field is slightly more than one percent stronger at apogee new moon versus perigee full moon. Thus very close perigees at full moon make sense as a result of the preceding far apogee new moon. Absentmindedly ignoring that to "design" a long TSE has me now shaking my head in both annoyance and amusement. Headstrong to "prove" a point.

Over the last week I looked at multiple perigee "present-era" new moons near the time of aphelion and the corresponding Earth-Sun distances and I cannot "design an eclipse longer than 7:31". There are many seemingly good candidates, new moon July 6, 2062 is only 1.5 hours from perigee; it is 150 km closer and the Sun is 19,000 miles farther than the July 16 2186 eclipse so it would seem to have more duration potential but it does not because the lunar angular velocity is rather fast (0.25% larger shadow but 0.45% greater relative speed). July 15 2053 is slower angular speed but too far yielding a small shadow. If I manipulate the July 16 2186 eclipse with tilt, hour angle and site latitude as mentioned in my previous analysis, duration would be 7:31.

How can the new moon of July 6, 2062 be closer and not produce more duration when fitted into the 2186 eclipse? Isn't a closer new moon always better? Most of the time but not under all circumstances. I dislike the way I have described this in the past so here is (hopefully) a much better description. Let's put the site at the North Pole to eliminate site speed from the mix. A close (big) fast moon will "eclipse" a star for less time than a far (small) slow moon due to the Kepler speed law. If we look at this star eclipse the same way we look at a solar eclipse it still makes sense. The moon's shadow cone for a star (4 light-years away) eclipse extends 16 times farther past Pluto so for that eclipse the diameter of the umbra at Earth's location is essentially constant regardless of our distance from the Moon. That means the eclipse duration (stellar occultation) is mainly a function of Moon speed not distance.

For a total solar (almost annular) eclipse that is very short duration with let's say a 1 mile diameter shadow roughly 100 miles from the end of the umbra cone, a small change in Moon distance can significantly increase shadow size. Bringing the moon only 200 miles closer would triple duration and the size of the shadow without much of a moon angular speed change. In this case the eclipse duration is mainly a function of Moon distance not speed. But these super long eclipses I am trying to "design" are very deep into the cone, over 17,000 miles into it so they are more like the stellar occultation. The same ratio applies of "200 miles deeper would make the shadow 2 miles larger" but the shadow would only grow about 1% from 160 miles to 162. Big penalty in speed, small gain in size.

The distance of apogee does not vary by much month to month although the value of perigee can change quite a bit. Minimum vs. maximum apogee is a 0.6% spread and minimum vs. maximum perigee is a 3.9% spread. If Newton couldn't solve the three-body problem I certainly can't, but I look at the pendulum effect of a child's swing to help me through. The Moon is forever swapping potential energy (higher apogee) and kinetic energy (faster perigee) in an exact analogy of pendulum effect. Imagine the child's swing but not moving simply back and forth; add a little side motion, swinging a bit to the right moving forward and a little to the left returning back. The apogee could be purely straight back and high (extreme apogee) or it could have some sideways speed (some added side kinetic energy) and be not quite so high (but total energy is the same).

The key here is the only means to adjust distance and speed is by pulling; axiom: "You can't push on a rope". As the swing moves down through the arc you could easily shorten it and have a slower, higher than normal perigee at the (temporarily higher) bottom of the arc. And still have the same apogee at the top because although the swing has less speed to get there, it now needs less vertical height to accomplish that. So it is easy to change the perigees (low point of the swing) but not much you can do about the apogees.

And Venus, Jupiter & Sun can't push on the rope either, only pull. But the above generalization is not entirely true. Apogees do not follow the rule of "closer to Earth is faster angular speed". There are fast and slow (angular velocity) apogees at equal distances from Earth and some apogees with the same angular speed at different distances. How so, if energy is constant?(ignoring tides) The energy is constant for the sum of all the energies of all the bodies including Sun, Venus, Jupiter, etc. The Earth-Moon system per-

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## SETalk

turbs all those other bodies too. Just like those whirligig desktop gadgets with 3 or 4 chrome balls zinging around, when one ball exceptionally speeds up another one or two exceptionally slows down; total energy is constant.

Although perigees have more variability of distance they rather strictly follow the rule of "closer to Earth is faster angular speed". Evection, variation, Great Venus Term, etc. prevent the Moon's angular velocity from being exactly a function of  $1/r$  squared. I do not have sufficient formal training to assiduously explain the differences between apogee and perigee but I do have a consistent analogy. At the instant reaching the top of the arc of the child's swing, ideally there is zero speed but perturbations (like Venus on the Moon) could slightly accelerate or decelerate it; a small acceleration on a body at zero speed is conspicuous. At the bottom of the arc when speed is fastest small accelerations seem overshadowed.

Now I too have swung to the opposite side of my conclusion last week: I found it somewhat surprising (considering it is a new moon) that the perigee associated with the July 2186 eclipse is only about 500 miles (one-quarter of the Moon's diameter) from being near absolute minimum perigee! The distance quoted by Jean Meeus is even a few kilometers closer than that which I quoted from JPL. But looking at the next 75 years (a random selection) I found that the full moons average 380,943 miles and new moons average 381,434, again about 500 miles closer. So new moons tend to be farther, although that is not absolute. Years 2058 through 2064 the average is the opposite—381,250 miles for the full moons and 381,180 for new moons.

This pendulum aspect has other ties. It carries over to the tides in the Bay of Fundy. Everyone should make a point of seeing them, it is mind-boggling. The highest tides do not occur at perigee but about 1 or 2 days later. The draining and refilling of the Minas Basin on the bay's east end sets up a momentum effect like sloshing water in the tub. The lowest lows create the highest high tides by first providing a more-empty tub and then this emptier void allows the water to come rushing in faster and with higher momentum which results in higher highs. Opposite is also true, overly high water tends to rush out faster. You feel like you witnessed a biblical miracle seeing a vast 20 x 50 mile "ocean" fill over 50 feet in only an hour and a half—*if you were in the middle of it you would drown.* We rode the inrushing tidal bore up the river rapids in the 'wrong' direction for 15 miles. Wild.

Regarding 7:31, I received an email from Fred Espenak in which he says Quote , " "Totality: Eclipses of the Sun" (Littmann, Willcox and Espenak) quotes the theoretical maximum for the duration of totality as 7 minutes 31 sec-

onds (page 22). This figure comes from a oral paper by Isabel M. Lewis (U. S. Naval Observatory) which she delivered at the forty-second meeting of the American Astronomical Society (1929). Unfortunately, the paper was never published but I do have the abstract for it. Lewis says (in part):

"Calculations were made to test out various combinations of circumstances with a view to obtaining the maximum duration. It appears that the most favorable combination of circumstances possible at least for some centuries to come, will occur early in the month of July; when the Sun is at or near apogee; when the Moon is at perigee and at its ascending node and its latitude is 24 minutes South; and when the observer is on the equator. A computation for such a combination gave a value of 7m31.1s with the formulae and constants employed in calculating the duration of total eclipses given in the American Ephemeris." End quote

Wasn't the USNO back then using the larger  $k$  value, 0.2724880, for the Moon diameter? If so, their max. duration times should be 4.6 seconds higher than those obtained using 0.2722810 (it is not simply the ratio of the  $k$  values). Their lower duration value would suggest they really did place the site on the equator. I most respectfully submit that the optimal site is not the equator. My results for positive 4.81 latitude duration are 7:31 using the small  $k$  value. By having the site at + 4.81 degrees latitude, although the site/shadow relative speed is 1.0028 times higher (site speed is slower), the shadow is 1.00619 times larger providing 1.7 more seconds of duration than the equatorial site.

I agree that to inspect eclipses far into the future when Earth orbit eccentricity has evolved would be changing the rules of the game and not a fair attack on the 7:31 issue.

Thank you for your forbearance of my diversion in the past week. I dislike making errors but my mistakes often are one of my personal best teachers. As the heretic who left the Church, I am now its staunchest defender of 7:31. Sincerely Raymond Brooks

From: FRED ESPENAK

I concur with Jean Meeus and Ray Brooks that the maximum duration for a total solar eclipse is 7 minutes 31 seconds for the current period in time. This assumes a value of  $k=0.272281$  (ratio of diameters of Moon to Earth). Use a different lunar diameter and you'll get a different answer.

If you want to extrapolate tens of thousands of years or more into the future or past, then the changes in Earth's eccentricity will result in a different maximum duration for a

(Continued on page 17)

## SETalk

total eclipse.

The NASA Eclipse Home Page has an 8,000 year catalog solar eclipses (both total and annular) with durations of unusual length:

<http://sunearth.gsfc.nasa.gov/eclipse/SEcatmax/SEcatmax.html>

If you are interested total eclipses lasting 7 minutes or more, see: <http://sunearth.gsfc.nasa.gov/eclipse/SEcatmax/SE-2999-5000MaxT.html>

For annular eclipses lasting 11 minutes or more, see: <http://sunearth.gsfc.nasa.gov/eclipse/SEcatmax/SE-2999-5000MaxA.html>

For hybrid eclipses lasting 1 minute 30 seconds or more, see: <http://sunearth.gsfc.nasa.gov/eclipse/SEcatmax/SE-1999-4000MaxH.html> - Fred Espenak

From: Dale Ireland

Doesn't the diameter of the Sun (photosphere) change? Or is the variation too small to make a difference for eclipse durations. Dale

From: Vic & Jen Winter - ICSTARS Astronomy

The larger of the factor affecting apparent disk size will be the Sun's ephemeris.

Rick Hill of ALPO is their Solar Section coordinator and posts a lot of Solar Information on at: <http://www.lpl.arizona.edu/~rhill/alpo/solstuff/solintro.html> You can see the diameter variations on the Solar Ephemeris' page <http://www.lpl.arizona.edu/~rhill/alpo/solstuff/ephems/ephem2001.html> 32.530 arc minutes to 32.530

Fred's 2001 ephemeris calculation page: <http://sunearth.gsfc.nasa.gov/eclipse/TTYPE/sun2.html> Here, Apparent Angular Diameter of the Sun (arc-seconds) varies from 1888.0 " to 1951.9"

I'd suggest some great reading and learning opportunities in the book "Nearest Star, The Surprising Science of Our Sun" by Jay M. Pasachoff and Leon Golub. It discusses the visible size and opacity of the photosphere (a few thousand miles thick). The edge is 'fuzzy' in opacity to about 100 miles. (still a distance that isn't resolvable naked eye).

I suspect that in the scheme of eclipse durations, that this is a factor that Fred has duly incorporated into his

calculations to the best of his ability and calculability. Jen Winter - Owner

From: barr derryll

Ray: Or as Shakespeare said perhaps more succinctly: ". . . the heresies that men do leave/ Are hated most of those they did deceive." MSND, II, ii, 139 - 140 .

From: wnowak

First of all I must apologize to everybody for my mistake. I am not an astronomer, and I do not know the details of Chapront's ELP lunar theory. The fact is however, that obviously close to perigee the speed of the Moon going towards the Earth ( or opposite ) must change more or less like  $\sin(x)$  where  $x$  is angular distance of the Moon from its "perigee position" in the sky. My "linear-ization" was of course not correct. So my second argument is not valid any longer.

However, my first argument still stands.

1. First of all I do not think that comparing 4232 years to the age of dinosaurs ( 65 000 000 ! ) is fair. We are talking about historic times, when first pyramids in Egypt were already built. It is important to know ( for me at least ) what was the maximum possible duration of the total eclipse during times of ancient Egyptians.

2. We all agree that the eclipse 2168 July 5th will "produce" a value of ratio 1.081. Even this value is high enough to go beyond "7&31 dogma" horizon. Based on my calculations ( I posted that a few days ago ) for every additional .001 of ratio we get additional 5 seconds of time of duration ( for very long eclipses ). So assumption of this ratio ( 1.081 ) for the eclipse of 2186 ( ratio 1.080 ) would take us above 7.31 ( 7.29 plus 5 equals 7.34 ). Please remember that the eclipse of 2186 will not take place on the equator ( 7.4N is the location, additional possible 1, 2 maybe 3 seconds ? ) 2186 minus 2002 is equal 184 years from now. Again, for me it is not that far.

3. I have just analysed "yesterday" and "tomorrow". What about "today" then ? If the value of ratio equal 1.081 is possible in the year 2168. Why it is not theoretically possible today ? I simply do not understand this . If we go back in time, then the changed eccentricity of the orbit of our planet "helps", so that the ratio can go as high as 1.082. If we go to the future then, it should be opposite. Of course it can be, that it just happened that we live exactly at the moment of minimum value of eccentricity. In this case, it does not matter if we go "uphill", or "downhill" ( what is the period of these changes, and our "phase location"? ) Maybe the eccentricity of the orbit of the Moon gets changed also. This is another question. How stable is the eccentricity of the orbit of the Moon ?

## SETalk

What prevents an eclipse, like for example 2009.07.22 ( "our times" ? , ratio 1.080 ), from having the duration longer than 7.31, assuming that this eclipse would happen on equator, and the ratio would be equal 1.081 ?

I still think that "7&31 dogma" does not look very convincing, even for "today". By the way, the definition of "today" ( or "our times " ) is an open issue. Not yet defined. W. A. Nowak.

From: Rybrks1@cs.com

I know the sun oscillates according to some of the helioseismology articles but I do not know if it expands and contracts periodically. Over billions of years it greatly varies. The photosphere is only about 250 miles thick and I believe the thickness is quite constant.

If the sun were 100 miles less in diameter (50 radius) which is about 1 part in 10,000 then the greatest eclipse next month would be 0.6 seconds longer duration. Ray Brooks

From: wnowak

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From: Jean Meeus

I wish to make the following comments to the new mail of Mr Nowak.

*(Continued on page 19)*

## SETalk

(a) The mention of the dinosaurs was a joke, of course. I can understand that Mr Nowak is interested for the longest possible duration of a total solar eclipse around the year -2200. But this is 42 centuries ago, far from the modern period. So in those remote times the longest possible TSE could be a few seconds different from the present value. I wish to repeat that the value 7:31 is for the modern period, say between the years 1500 and 2500, or something like that. Not only does the eccentricity of the Earth's orbit vary with time. The longitude of its perihelion, too, varies. Presently, this variation is +1.72 degrees per century. The longitude of the perihelion is now 103 degrees. The Earth reaches this longitude about January 4, two weeks after the winter solstice. But in the year -2200 that longitude was 32 degrees, and the Earth reached perihelion about one month after the autumnal equinox! Such a variation, too, can affect sensibly the longest possible duration of a TSE.

(b) I do agree that a ratio of 1.081 is possible nowadays. The value of 1.080 which I mentioned earlier resulted from a search among only the eclipses from 1950 to 2050. The eccentricity of the Earth's orbit has been decreasing since many centuries, and it will continue to decrease till about the year 29500.

(c) One might think that the longest TSE must occur exactly at the equator, where the velocity of the Earth's surface is greatest. But that is not the case, for the following reason. The greatest ratio of the Moon/Sun diameters takes place close to the time when the Earth is at aphelion. Near the year 2000, this occurs near July 5. But then the declination of the Sun is +23 deg, not zero. So, an observer having the Sun-in-apogee and at the zenith is at latitude 23 deg north. Now, if we move from this latitude towards the equator, the altitude of the Sun will decrease and so will the diameter of the lunar shadow, thus decreasing the duration of total eclipse. But at the same time the rotational speed of the Earth's surface increases, and this increases the duration. There is partial compensation. It appears that the maximum possible duration continues to increase up to latitude 5 deg North, then begins to decrease definitely. Hence, with the present position of the perihelion, the longest possible TSE occurs round latitude 5°N, not at the equator. Jean Meeus

From: wnowak

I think that I understand the mechanism of precession of equinoxes. The fact that the perfect location is shifted a bit to the north, has also other interesting consequences. For example the probability of the eclipse on the Northern Hemisphere is higher than on the Southern one. One would think - small difference, but the fact is that you can see in statistical data that indeed, northern eclipses are more frequent than southern eclipses. So we live in the times of dominant northern eclipses ( we have "just" passed the peak, since 22nd of June is not that far from the 5th of July, it must have taken place around 1000 years ago ).

Considering the maximum impact of this fact on the maximum duration ? I do not think that it is a big one ( less than two seconds ? ). Please note that it will take more than 5 000 years, to get back to the situation when the best point for the longest eclipse will be again on the equator. In my opinion 4200 years ago, it was not very different from today. I think that it was better ( from the point of view of maximum duration ) , since the best eclipse point was closer to equator. The same for future, since we have passed the peak already, it can only get better. The theoretical "best" location is closer and closer to the equator every day ( 0.25 meter /day ? ), and the theoretical maximum duration is longer every day by extremely small amount of time. However this is "overshadowed" by the aphelion distance getting smaller, making effectively the maximum duration shorter.

Going back to the "7&31" dogma. I believe that we are very close to final conclusions. If we agree that modern times are located between 1500 A.D. and 2500 A.D. , and the fact that ratio 1.081 is possible in modern times, then it is high time to destroy the "dam of 7&31 dogma", and let the "river of free thinking flow again".

Assuming perfect location of the eclipse at 4.81N, and ratio 1.081, and the date close to aphelion in July, there is nothing that blocks the eclipse from having the duration ( pessimistically speaking ) equal to 7 minutes and 35 seconds. Is this correct ?

There is no alternative definition of "modern times", that would allow us to say "for the period from YYYY to ZZZZ 7&31 is the theoretical maximum". Is this correct ?

(Continued on page 20)

## SETalk

( of course all other assumptions  $k$  -value, etc. are unchanged )

Talking about our times;

Good candidate that "failed" very close to our days is probably 1991.07.11 ( ratio 1.080 almost good, but bad location 22N, final "score" - 6 min. 53 seconds ).

Good candidate that will "fail" not far from today is the eclipse 2009.07.22 ( ratio 1.080 also almost good, but location even worse 24N, "score" - only 6 min. 39 seconds ). W. A. Nowak.

From: Jean Meeus

Here are some further remarks about my mail of two days ago.

About 4100 B.C., the longitude of the perihelion of the Earth's orbit was 0 deg. Then the Earth reached aphelion at the spring (March) equinox. One might think that this increased the maximum possible duration of a TSE, because an eclipse with the Sun at apogee occurred at declination zero, hence right above the equator, where the rotational speed of the Earth's surface is greatest. But in reality things are more complicated.

When a solar eclipse occurs near the vernal equinox, then the Moon is moving rapidly to greater northern declinations. In such a case, while an observer at the equator is moving exactly in the West-East direction, the lunar shadow does not.

Sixty centuries ago, the obliquity of the ecliptic was 24 degrees. Because the Moon's orbit is inclined at 5 deg to the ecliptic, the Moon's path at such an eclipse would have been  $24 + 5 = 29$  degrees if the eclipse took place at the ascending node of the Moon's orbit, and only  $24 - 5 = 19$  degrees if it took place at the descending node. In both cases, the Moon's shadow would not have moving due East, but at an angle of 29 or 19 deg to the equator. And this results in a \*lesser\* increase of the duration of a TSE due to the Earth's rotation.

It really is a complicated problem, as several factors are changing gradually. Already I cited the variations of the eccentricity of the Earth's orbit and the motion of its perihelion with respect to the vernal equinox. But there is more.

Although the mean eccentricity of the lunar orbit remains constant, the extreme possible perigee distances do slowly vary. Between the years -1500 and +8000, only twice is the Earth-Moon distance smaller than 356,360 km. Both cases

occurred about 30 centuries ago, in the years -1054 and -850. On 2257 Jan 1, the distance will be 356,371 km, but there will be no other such short distance until well after A. D. 8000. See Chapter of my "More Mathematical Astronomy Morsels". I don't know, however, whether this is relevant to the problem, because all those extreme perigee distances take place when the Earth is near the \*perihelion\* of its orbit. Jean Meeus

From: Jean Meeus

The following is to illustrate what I told yesterday -- and I finally hope this will be the last mail about this matter!

Suppose that, around the year -2200, the ratio of the diameters Moon/Sun could be as large as 1.083. One might think, as Mr Nowak, that this would result in a longer possible duration of totality, say 7m40s instead of the presently possible 7m31s.

However, this supposes that the lunar shadow and the observer are moving in almost parallel directions (as at the eclipse of 2186 July 16), so that the Earth's rotation can act with greatest efficiency to decrease the speed of the lunar shadow with respect to the observer.

But things were different 42 centuries ago, when the passage of the Sun at the apogee took place much closer to the vernal equinox, resulting in a more inclined path of the motion of the shadow.

Let us give a few numbers. They are not the truly exact value, but are given here only for the purpose of illustration.

Suppose the speed of the Moon's shadow in the fundamental plane is 1000 meters per second, and that the speed of the observer (close to the equator) is 450 meters/second. The difference is 550 m/second. This would be the relative speed if the shadow moved in exactly the same direction as the observer.

But let us suppose now that, because the eclipse occurs rather close to the equinox, the shadow moves at an angle of 15 degrees to the equator (in the fundamental plane). What, then, will be its speed relative to the observer? It is easy to calculate that the "vertical" component would be  $1000 * \sin(15 \text{ deg})$ , and that the "horizontal" component would be  $1000 * \cos(15 \text{ deg}) - 450$ , so that the relative speed would be 577 m/second, instead of 550. Instead of a duration of 7m40s or 460 seconds, the duration will then be  $460 * 550/577$ , that is 438 seconds or 7m18s, more than 10 seconds LESS than the presently possible.

(Continued on page 21)

## SETalk

May I finally point out that, while the subject is (of course) interesting from a theoretical point of view, it has not the slightest importance for historical research. Even if by 2200 B.C. the possible maximum would be 7m40s instead of 7m31s, what could be the importance of this slight difference for the study of the history of Ancient Egypt? Jean Meeus

**New Moon October 2002**

From: Rybrks1@cs.com To: SOLARECLIPSES@AULA.COM Date: Thu, 03 Oct 2002 16:24:35

New Moon this month is October 6, 2002 at 11:18 UT

Only two MOON-ths to go to the next eclipse. (derivative of the word month)

All of the five new moons between the June Puerto Vallarta eclipse and the December Africa/Aussie eclipse are high passes over the sun. (low passes for you upside-down blokes in Australia)

The first two passes of these five, July & Aug, were associated with the ascending node and will come to Earth in the future as eclipses (refer to SENL) and the last two of the five, Oct & November, associated with the descending node were already here as eclipses in the past. The middle new moon of the five, September high pass, nearly exactly split the nodes but slightly favored being closer to the descending node so it too is like Oct and Nov and was already here as eclipses (refer to SENL).

(Note: Splitting the nodes as a new moon is not the same as splitting the eclipses. If you looked at how central the Sept new moon is relative to the eclipses you would think it is more closely associated with June, the wrong node. The Earth passed through the nodes a few days before both the June 2002 and Dec 2002 eclipses.)

The new moon coming Monday is part of extended Saros 66 which visited Earth as mostly totals starting in May 612 BC. It switched to one hybrid eclipse and three annulars before leaving Earth Oct 217 AD. The partials ended May 582 AD and all the new moons have been high passes ever since. It will evolve into Saros 289 ( $66 + 223 = 289$ , although 223 is not always the magic adder - not sure why) and return to Earth from the north associated with the other node. It returns Aug 6149 as one annular then one hybrid then all totals.

The shadow of next week's new Moon at the Earth's Vertical Centerline is 94.1 miles in diameter and would allow someone to witness a 2 minute 28 second total solar eclipse if positioned just less than 2 Earth diameters above the Earth's limb as the shadow rushed by at 2,289 mph. The shadow cone extends 10,100 miles (about 2.5 radii) beyond the center of Earth. All these values are almost exactly the same as last month's new moon even though this month new moon is 2000 miles closer. The reason is both the Moon \*and\* the Sun are closer to Earth this month.

Perigee is very close to this new moon (just a bit over 2 hours later). New Moon is only 4 miles farther than perigee. Raymond Brooks

From: Robert B Slobins

For those in the USA, there is an interesting article in the current issue of the magazine 'Weatherwise' about this new moon and one that occurred at the time of a devastating storm in the Canadian maritimes known as Saxby's Gale. Saxby called this storm way in advance using astronomical data. Joe Rao is the author. -- Robert B Slobins



## SETalk

**Safe eclipse viewing`**

From: Mick Wolf To: SOLARECLIPSES@AULA.COM Date: Mon, 14 Oct 2002 04:28:50

At the present time we are bombarded with articles on the viewing of eclipses .and the safety of viewing. Some are real shockers. There are ways and methods to do so safely, based on fact and science and not hearsay or false information. I have seen and photographed 13 TSE and annular eclipses, so I am compelled to make comments on very detrimental statements which may put people off from witnessing the most beautiful spectacle the nature provides.

Here are only a few examples- use your common sense and judge for yourself:

1) A lady stared at the sun for half an hour.....was she nuts or trying to be mentioned the Guinness Book of records?

2) One was a lady who watched the eclipse in 1976 and now has eclipse blindness ,,,,,,,,,,she claims that there no public warning .....To clarify this statement I would like to mention that the late Dr Howard Edelman, Secretary of ASSA at that time, was warning TV viewers of the danger of naked eye viewing of the eclipse because it was only partial in Adelaide. However, the press in Victoria modified it "a bit" , which was not very welcome by overseas visitors.

3) The story black spots caused by eclipse is a bit to far fetched..... everybody has has them to some extend, and the have nothing to do with looking at the sun she had them before and she will have them now ( probably more of them as she gets older).

4) 1959 TSE in Australia had 170 reported cases of eclipse blindness.. very funny report as there was no TSE in 1959 it was a partial one, which I photographed at that time.

5) ...a gentleman who watched the 1945 eclipse through a pinhole is completely blind in one eye., and the outside surface of his eye is hard boiled like an egg .....this magic pinhole story is a hard to swallow .

So, if you believe all tis nonsense and are scared to death, forget about watching the TSE and do as the natives did in Jawa, 1983, they hid indoors and beat tins, pots and drums to chase away the dragon, who was swallowing the sun. By the way, they successfully chased the dragon away.

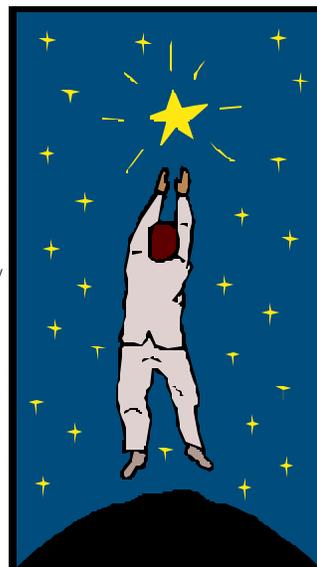
Now it is up to you to make mind. but I am going to see the 14th TSE. Mick Wolf, (ASSA).

**Nearest Star; photosphere**

From: Jay.M.Pasachoff@williams.edu To: solareclipses@aula.com Date: Tue, 22 Oct 2002 22:10:40

Thanks, Jen, for the nice mention of my solar book with Leon Golub. The paperback edition has just been published this week, and includes a few updates from last year's hardback. You can read some reviews at [www.williams.edu/astronomy/neareststar](http://www.williams.edu/astronomy/neareststar). There is also an ordering link for the hardback there. You can order either version and see some additional information at the Harvard University Press site: <http://www.hup.harvard.edu/catalog/GOLNEA.html>.

The answer to the original question asked on this mailing list is: People have looked quite hard for 20 years or so to see if the solar diameter is changing and the answer is "no." There were some early reports of a slight change but they have been discredited. Of course, there is some change in apparent diameter caused by the Earth's slightly elliptical orbit around the Sun. But there is no intrinsic change in size of the photosphere. Jay Pasachoff



## SETalk

### Filter for Partial Phases of Eclipse using Digital Camera

From: Gerard M Foley To: SOLARECLIPSES@AULA.COM at: Tue, 22 Oct 2002 21:05:54

I own an Olympus C2100UZi Digital Camera, with around 2 megapixel CCD and 10X Zoom lens. At maximum zoom the lens is approximately equivalent in angular coverage to a 380mm lens used with 24x36mm (35mm) film. The camera has image stabilization. I plan to carry it to the Indian Ocean aboard the ship Olympic Countess to witness the total solar eclipse of 4 December 2002.

In the hope of making some pictures of the partial phases of the eclipse, a couple of months ago I ordered a B+W ND6 neutral density filter from B&H Photo in New York City. The filter had to be ordered from Germany. I received it 2 days ago. Fortunately there have been few clouds in Central Ohio since.

I set the camera to manual, 1/800 second exposure, ISO 100 and f8.0, the smallest aperture of which it is capable. The image of the sun was heavily overexposed. I found I had two linear polarizing filters which I could cross to reduce the transmission, and confirmed that the camera was capable of imaging the two large sunspot groups visible currently. A local camera store had an ND0.6 filter of the right size. This also permitted me to get an image of the spots.

These images are displayed at <http://foley.ultinet.net/~gerry/sun.html>

They are not represented as the particularly good images of the uneclipsed sun!

I was surprised and disappointed to find that an ND6 filter by itself did not attenuate the light sufficiently for my camera to accommodate. Anyone who is using filtering with any camera, film or digital, with automatic exposure control must be aware that the sun image will ordinarily be only a very small part of the whole, so that precaution is usually necessary to avoid overexposure.

Gerry <http://home.columbus.rr.com/gfoley> <http://www.fortunecity.com/victorian/pollock/263/egypt/egypt.html>

From: Assoc Prof J R Huddle

I'm only guessing, because I have not tested your particular ND-6 filter, but many ND filters only filter out visible light, and pass UV and IR, at least to some extent. This is exactly why ND filters are not recommended for eclipse work: A filter may be ND-6 for light in the range 400 - 700 nanometers, but much less optically dense for UV and IR. Your CCD is probably sensitive to both UV and IR to some extent; I know that my camcorder can "see" wavelengths that are longer than 700 nm and shorter than 400 nm, that humans cannot see with their eyes. Using ND filters with a DIGITAL camera is not unsafe for eclipse work, because the sun's light is absorbed in the CCD and therefore does not reach your eye. Jim Huddle

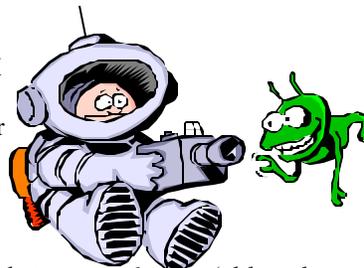
From: Dale Ireland

Gerry I believe you have a mix up in nomenclature. Your filter is almost certainly a 6X not a true ND6. Most solar filters are ND 4 or 5 meaning they reduce the light to  $1 \times 10^{-4}$  or  $-5$ . (.00001). A 6X reduces the light by 6 f/stops, I believe, or only a factor of 64. Dale

From: Dale Ireland

Mistake, a 6x filter is what it sounds like, 6 times difference in the exposure or  $2 \frac{2}{3}$  stops not 6 stops (although some sites say just 2 stops).

From: Assoc Prof J R Huddle



*(Continued on page 24)*

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Dale may be correct - he knows WAY more about photographic equipment than I ever will; I've seen some of his stuff, and that much is clear. But my previous comment still stands: Most ND filters for photo use are NOT safe for viewing the sun!  
Jim Huddle

From: Dale Ireland

Hello Gerry I am sorry I jumped to conclusions about your filter. Yes the B+W ND6 is a true ND6 filter, attenuating the light by 20 f/stops. I have discovered your problem. I found a transmission graph for this filter. It transmits much more energy in the IR range. At 700nm (red visible) it is an ND6 filter but by only 800nm it is an ND4 and the curve goes up steeply. I have the Olympus 202 and many people have discovered that these Olympus cameras do not have the IR filters common in many other digital cameras. For instance, if you point your camera at TV remote control and push a button it looks like a flashlight on the Olympus screen. So, the IR transmission of the filter combined with the IR sensitivity of your camera resulted in the over exposed image. You need an IR rejection filter. This also shows that the B+W filter would be dangerous to use as a visual solar filter. dale

From: Dale Ireland

I would also like to add, that the Kodak Wratten filters do not have the IR problem that the B+W filters have. The Wrattens are even more opaque in IR than visible and very safe, and I am talking about the gelatin filters. I used Kodak Wratten gelatin filters for a couple eclipses. They are cheap, cheaper than Baader or any other solar filters and they transmit evenly across the visible spectrum so there is no color change to the Sun. You just get a plastic Kodak screw-on gelatin filter holder for your lens. A big advantage is that you can easily add them together, get an ND4 and a couple of ND1's and you just put as many extra ND1's in the holder as you need depending on the film you are using. Dale

From: Mick Wolf

> I would also like to add, that the Kodak Wratten filters do not have the IR problem that the B+W filters have. The Wrattens are even more opaque in IR-----sorry,that is wrong.

In order to clarify the confusion re neutral density filters and their spectral transmission,and the spectral sensitivity of films I am supplying the following:

- 1) Kodak WRATTEN neutral density filters are available in steps of D .1 to D3 and they are neutral in the visible only (.7 microns). In near IR and IR their transmission approaches 100%.
- 2)Schott glass catalogue gives transmission of glasses from .2 microns to .7microns.
- 3)B+W films are sensitive from UV to .7microns.Kodsak Tmax 100 + 400 .cut off at .7microns.Colour films are sensitive to visual only and the dark un- exposed film (the black part) transmits IR.There are scientific emulsion which have extended spectral sensitivity (IN+IM---to 1.2 microns) B+W films or plates can be developed to D3 and then the 2 films are sandwiched together to avoid pinholes.
- 4) NOTE! there is a difference between photo and visual use.
- 5) For visual work the density filters must have a flat spectral response from UV to IR.Eveporised Ag,Al,Ni or Cr areOK. Thousand Oaks and Baader filters are suitable but can be easily demaged.Baader filters drop about to D4 in IR from visible D5. I hope this will help you to decide how to photograph or view partial solar eclipses. Mick Wolf.

From: Gordon

Dale and Gerry, I think that you can't beat the Thousand Oaks Type 2 Plus glass solar filters or the Orion Full-Aperture glass solar filters. They are well worth the money!

I have found that the solar disk exposure with the Thousand Oaks filters is always predictable, with many camera and lens combinations, including digital cameras.

In fact, when keeping the aperture and ISO setting the same, the solar disk exposure is exactly the same when using a 35 mm SLR and a Nikon CoolPix 990/995 side by side. Very predictable. It is a lot less hassle when you use the same solar

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filter on all of your cameras, digital or film. With these filters the different types of cameras will expose the same. I only have experience with the Nikon CoolPix cameras, but I really do imagine it would be just as predictable with other digital cameras and these glass filters.

Also, when you do your sample solar images using all glass solar filters, to determine what exposure of the partial phases appeals to you, meaning the range of color from deep orange (short shutter speed) to bright yellow (long shutter speed), you establish a camera aperture and shutter combination that puts you in the range of exposures that you will use for your totality images. For example, last year in Africa my wife and I took partial phase images at apertures of f/11 (digital camera) and f/12 (film camera), ISO 200 (on both) and our partial phases shutter speed was 1/60 of a second for both cameras. We determined that we liked a color of the partial phases that was a light orange and not too bright. This shutter speed of 1/60 of a second was also a perfect shutter speed for inner corona images.

So my point is, with glass solar filters of the Thousand Oaks type, if you use an exposure that gives you a light orange partial phase solar disk, you are now in the range of exposures you will need for totality when you take your solar filter off. This may not be true if you are using some combination of stacked filters that have different transmissions. It also gets more complicated if you are using different filters on different cameras. It's nice to get rid of one variable in the optical chain, use the same filters on all cameras and get comfortable with how they expose. Since you can't "practice" during totality, you have to make some educated judgments ahead of time and compare carefully the exposure settings of others before you.

Our images can be seen on our website [http://www.eclipsesetimer.com/africa\\_2001.htm](http://www.eclipsesetimer.com/africa_2001.htm)

Thanks. This has been an interesting thread. Gordon [www.eclipsesetimer.com](http://www.eclipsesetimer.com)

From: Jay.M.Pasachoff@williams.edu

I haven't been able to find the graph yet of transmission vs. wavelength, but the Kodak Web site and technical bulletin say:  
\* Solar Eclipse Photography: Tech Pub P-150A Do not look at the sun through photographic neutral density filters, crossed polarizing filters, or processed color film since these materials appear dark but transmit infrared energy that can burn your eyes.

Kodak's bulletin is on line at [www.kodak.com/cluster/global/en/consumer/products/techInfo/p150a/p150a.shtml](http://www.kodak.com/cluster/global/en/consumer/products/techInfo/p150a/p150a.shtml)

Kodak's search is at <http://www.kodak.com/cgi-bin/searchKodak.cgi> but I haven't succeeded in finding the Filter Bulletin that has all the transmission curves. I have always heard that Wratten Neutral Density filters transmit in the infrared. Jay

From: Dale Ireland

Jay Yes I found the "official" graph of Kodak Wratten neutral density filters and they do transmit more energy in the IR but nothing like the B+W's. An ND6 filter drops a little after 700nm and levels out remaining about an ND4 all the way to 900nm where the graph ends. Maybe it gets worse beyond where they have it graphed? So you are right they shouldn't be used on a scope and probably not for naked eye either. Both filters are totally opaque in the UV Kodak Photographic Filters Handbook 1990 page 132 Dale

From: Glenn Schneider

I changed the title of this thread to specifically address this question, as I think this is important (was: Filter for Partial Phase of Eclipse for Digital Camera).

Dale Ireland wrote: I would also like to add, that the Kodak Wratten filters do not have the IR problem that the B+W filters have. The Wrattens are even more opaque in IR than visible and very safe, and I am talking about the gelatin filters.

I do not know where this information came from, but it is incorrect. Perhaps this is due to a nebulous definition of "IR", since the wavelength is specified, and maybe this is true in the thermal infrared, but not so in the near-IR. You could possi-



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ably do a lot of damage to your retina at wavelengths short of 1 micron (i.e. in the short wavelength near infrared) to which the eye is insensitive.

I am writing this from my lab where I have just tested a Kodak Wratten #96 ND 1 filter in my monochromator. This unit does not have enough sensitivity to test in the attenuation range ND 4-5, so I using a ND 1 as a surrogate to gauge the relative transmissivity as a function of wavelength across the optical and short wavelength near-IR. According to Kodak the spectral response of the ND series does not significantly change with optical density, so with the appropriate caveats, these measures should be representative. I must add, though, that I have measured a SINGLE ND 1 filter which was manufactured several years ago (at least that's when it was purchased), so the results must be viewed with caution as this could be an outlier. I have, though, also measured a ND 0.2 filter, which I purchased more recently, and is likely from a different manufacturing lot, and it has very similar spectral response to the ND 1 (relative transmissivity, not absolute of course). An ND 1 filter should be 10% transmissive regardless of wavelength - however as you will see this is not the case in the near UV and near IR. I fully suspect Kodak rates these filters with a canonical transmissivity in the optical at likely 5000-6000 Angstroms, where most people will use them.

So, here are the results from the near UV to the near IR (through the visible, of course):

WRATTEN #96 ND 1 (rated 10% transmission) Wavelength(Angstroms) % Transmittance

2500	< 0.1%
3000	0.7%
4000	4.5%
5000	9.3%
6000	9.8%
7000	10.1%
7500	21.9%
8000	25.5%
8500	25.
9000	25.1%



As you can see the filter does have the rated transmissivity in the optical, and it is quite opaque in the near ultraviolet (actually at 2500 Angstroms, below which I cannot measure reliably, it is less than 0.1% transmissive, or 1/100 of its rated optical transmissivity). In the near-IR however, actually longward of about 7200 Angstroms, it begins to transmit more light than what its "ND" rating implies.

So, in the wavelength range 7000-9000 Angstroms, where the eye has no sensitivity (well, maybe just a bit very close to 7000 Angstroms), in the near-IR, an ND filter will let through 2.5x as much light per wavelength interval than in the optical. Is a factor of 2.5x "brighter" enough for you to worry about the energy reaching your retina? Probably not - BUT do not take this as an endorsement, and read on. Unfortunately, I do not at the moment has access to my calibrated light source that would allow me to test at longer wavelengths (its on loan to another Project). I seriously doubt, however, that such a filter becomes much less transmissive as one moves toward longer wavelengths - at least until one gets quite far out - as there is no "blocking" or "cut-off" material in the simple gelatins. Keep in mind the above measures only go out to 9000 Angstroms, near-IR sunlight of course goes into the near-IR like a 5700K blackbody (to first order).

Also, filters like this might have a "red leak" and actually \*MAY\* be more transmissive further into the near-IR. I can't say these will (hope to test that at a future date). If anybody already has these data I would like to see them - like Jay I could not find them on the Kodak web site (which is why I headed for my lab this morning).

For my money - and piece of mind - I would use a filter which is near-IR blocking (like silver, chromium, Aluminum) or "fancier" ones for VIEWING the eclipse. If you just plan on putting such a filter over a camera lens (digital or otherwise) and NOT looking through the viewfinder then you should be fine with a Wratten ND. All commercial grade consumer CCDs drop like a rock in their spectral response longward of about 0.8 microns (and have zero response

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longward of a micron, as do all CCDs) so you won't "overexpose" and your lightmeter is metering in the visible. Of course, above I have only talked about the FILTER external to your camera. It is indeed possible that your camera has some internal rejection optics (filters or coatings) which are IR blocking. To determine that you'll probably have to consult your user manual (good luck finding anything useful in most "consumer oriented" manuals produced today) - or contact the manufacturer to find out.

All said, err on the side of caution. After all, it's really TOTALITY which is the motivator, not the partial phases, for which the best filter is, of course, none. Cheers, Glenn Schneider

From: Glenn Schneider

Dale, I do not have the handbook to which you refer. Are these figures available on the Web, if not do you have an ISBN number for the book so I can look for it in my main library here on campus?

See my last email. I didn't understand your above statement "Wratten neutral density filters and they do transmit more energy in the IR but nothing like the B+W's" It's the "nothing like the B+W's" part of it I don't understand - what does that mean? Your email says, that an ND6 \*DROPS\* "a little" after 700nm and levels out to ND4 at 900nm. BUT, this is not a drop, this is an INCREASE in transmissivity of a factor of 100! I don't see that in the filter I tested, I see an increase by a FACTOR of 2.5 between 700 and 900nm not 100. -GS-

From: Gerard M Foley

Thanks to those who have commented on my experience with the B+H ND6 filter.

The filter is almost certainly not 6X, because in spite of the risk involved, I looked briefly at the sun through it with the naked eye. I do not seem to have been injured. The visual brightness was comparable with that through the Number 12 welder's glass which has been a favorite eclipse viewer for some forty years.

The suggestion by Dale Ireland that the IR transmission of the B+H filter is responsible for the results is very interesting. It raises the question of whether the Tiffen ND0.6 filter which I added to the ND6 blocks enough IR to make the effective added attenuation much greater than the 0.6 (4X) that one would expect. The result is certainly radical enough to make this a possibility.

The experiment is detailed at <http://foley.ultinet.net/gerry/sun.html>

For what it is worth, experiment with the camera confirms the attenuation of the Tiffen ND0.6 filter as 4X, as it should be. I can't think of any home experiment to check the B+H ND6. Again, thanks to all

Gerry <http://home.columbus.rr.com/gfoley> <http://www.fortunecity.com/victorian/pollock/263/egypt/egypt.html>

I apologize if I have sent this before, but I can't find that I have, so here goes. G

From: Dale Ireland

Hi I think there is a lot of confusion about the graphs in this discussion and part of it is my fault for initially reading the graph incorrectly. Kodak publishes only one graph for its neutral density filters and they imply that it covers all the various filter densities. B+W has a graph for each density. The B+W graph for an ND1 filter looks like the "generic" Kodak graph, in other words it is pretty flat, even into the IR and I think that is what you confirmed in your test of an ND1. However, the graphs of the B+W filters show them to have a much more dramatic change in IR transmission as the density of the filter becomes greater. For instance an ND6 B+W filter is ND6 across the visible spectrum but then the transmittance shoots up after 700nm to almost the level of the ND1 filter by 900nm. I am starting to think that the Wrattens may have the same problem but Kodak just doesn't publish a graph for them. So the bottom line is, use the Wrattens for video or digital but not for anything visual. When I have a few minutes I will scan the graphs and put them on my web site for a short period until I get sued for copyright violation. Dale

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From: Gerard M Foley

I have made some more exposures. Although the forecast was for cloudy, the sun was quite bright at noon EDT. There were no clouds visible when I looked at the sun with eclipse shades. The general halo around the sun extended to about 20 degrees in radius.

Exposures through the B+H ND6 filter were as overexposed as ever. Exposures with the addition of a Vivitar Polarizing Filter (linear) marked 2X-4X, showed the sunspots as well or better than those through the combination of the B+H ND6 and Tiffen ND0.6 (the latter taken yesterday). The density of the exposure through the polarizing filter was slightly higher with the filter in one orientation than it was with the filter rotated 90 degrees.

I don't know exactly what the marking 2X-4X on the Vivitar filter means. A high quality polarizing filter should have an attenuation of at least 50 percent for randomly polarized light, plus a little for general absorption. This would put it about ND0.3

Probing the centers of the unprocessed image files with PaintShopPro 7.03 "dropper", which gives three values for RGB from an image, give the following results:

B+H ND6 and Tiffen ND0.6 R=255 G=247 B=244

B+H ND6 and Vivitar orientation 0 R=255 G=229 B=212

B+H ND6 and Vivitar orientation 90 R=255 G=232 B=217

White is R=255 G=255 B=255



My interpretation of this is that the red channels of all three images were still overexposed.

The ND0.6 exposure was taken yesterday, so there is no guarantee that the sky was equally transparent on the two days. I think these results indicate that the camera does have significant near IR sensitivity, that the Tiffen and Vivitar filters reduce the near IR much more than their nominal attenuations in the visible, and that the near IR transmission of the B+H filter is high, as suggested by Dale Ireland.

Splitting the channels into R,G and B with PSP7.03 shows that the sunspots are invisible in the red channel, but that a pretty good image of the spots, even with this camera, is available from the blue channel. A third spot is visible in the images taken today.

This seems to be additional confirmation that photographic filters are not necessarily safe as eye protection. Thanks to all Gerry

From: Dale Ireland

Hi I was totally wrong about the Wratten filters, they get worse and worse the deeper you go into the IR the Kodak graph for the 96 filters doesn't show it but I dug up some other graphs that do. I have posted the Kodak graphs and The B+W graphs here. Sorry again for posting erroneous, confusing info. look here <http://www.drdale.com/eclipses/filters.htm>

Anyway, as to the original question, The 2100 Olympus cam is overly sensitive to IR which the B+W filter passes, so it causes over exposure. Dale

From: Glenn Schneider

Dale, I haven't fully followed this thread, suspect I missed a few early postings. Reading this I likely mis-interpreted the meaning of "B+W". From your earlier positing:

>I would also like to add, that the Kodak Wratten filters do not have the IR problem that the B+W filters have. The Wrattens

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are even more opaque in IR than visible and very safe, and I am talking about the gelatin filters.

I presumed you had meant "Black and White" in the sense (very loosely) as optical monochrome to delineate from (near)-IR. Always bad to presume, I presume. So, sorry for my ignorance here but what does "B+W" mean in the context you are using it, and what does it refer to? Glenn Schneider

From: Glenn Schneider

Dale, Thanks for posting this. I looked at the graphs on your web site, and was actually quote amazed (and pleased) that the graph in the middle (wavelength vs. percentage transmittance) looks an awful LOT like the measures I made earlier this morning and posted (as a table). Where is this graph from? Can you provide a reference? Unfortunately they do not tabulate their near-UV/near-IR measures, but "reading them off the graph" it look like they are bang-on with what I measured in my lab, which is actually pretty amazing. This says (importantly) to me that (a) Kodak likely has pretty good quality control and there likely is very little variation in the manufacturing process from batch to batch. And (b) the filters probably don't degrade (much) with age. At least if they are well stored between uses (as mine are).

Also: I presume now (again I shouldn't presume) seeing this that "B&W" refers to using developed monochrome film as a silver filter - from the last chart. Where did that come from? I am dubious about using this without knowing its pedigree as this should be very dependent upon the particular type of film used and the development process. Also, what does "101,202,103..." for the family of curves mean on that chart. Obviously related to optical density, but how.

I think the point, though, is clear, and you shouldn't presume a high density "film filter" is spectrally flat (particularly in the near-IR) - though these data cut off just longward of 8000 Angstroms, as sunlight does not. -GS-

From: Dale Ireland

Glenn B+W is a brand of high quality filters made by Schneider optics in Germany. I don't know what the B+W stands for but it isn't "black and white" Good guess though. :) The statement about Wrattens being OK in IR was a mistake, I was looking at the graph wrong, I had too much cough medicine, my dog ate my notes, or something, whatever... :) I've used them, mostly for video but for some photos too and I am not blind, well maybe that's why I screwed up on the graph, hmmm, well anyway I don't recommend them for anyone else. Dale

From: Glenn Schneider

Ah! Thanks for the clarification. Maybe a long-lost relative of mine. Cheers, Glenn Schneider

From: Mike Simmons

Glenn, Dale doesn't seem to be available right now so I will relieve you of your confusion and consternation. B+W is a German make of high-quality photographic filters. Mike

From: Joel Moskowitz

Hi Glenn, B&W is a high end photo filter maker in Germany. Their filters are made from Schott glass, ground and polished smooth and parallel and multicoated. They make the best glass to put in front of your lens. As such they are expensive. They also seem to be the only source of ND filters in the densities that we are talking about.

From: Dale Ireland

You mean the graph for the Wratten #96 ND1 Neutral density filter?  
Kodak Photographic Filters Handbook 1990  
Library of Congress 90-80512  
ISBN 0-87985-658-0



## SETalk

I still assert that the denser Kodak filters will have curves more like the B+W graph below it Dale

From: Gerard M Foley

As additional evidence for the near IR transmission of the B+H ND6 filter and the near IR sensitivity of the Olympus C2100UZi, I have added a landscape taken through the filter to <http://foley.ultinet.net/~gerrt/sun.html>

Again thanks to Dale Ireland and the others who have enlightened me. Gerry

From: Gerard M Foley

Sorry for the mistyping of the URL about the landscape: <http://foley.ultinet.net/~gerry/sun.html> should work better. Gerry

From: dietmar.staps@wiesbaden.netsurf.de

Hello (B)iermann and (W)eber founded their company in my hometown Wiesbaden in 1947. About 200 meters away from the former camera-company EDIXA. In 1985 B+W became a part of Schneider Optics in Bad Kreuznach, about 50km from Wiesbaden or 100km from Frankfurt.

B+W in their booklet: filter 120 or (ND6) is not safe for visual solar observation because of IR transmission. The Filter Factor is 1 000 000 or 20 aperture stops. Greetings Dietmar Staps

From: Joseph Cali

I have used the same two pieces of KODAK ND4 since 1980 for numerous partial, annular and solar eclipses. I only upgraded to Baader film this year. Like Dale, I have not gone blind but I have always kept the Kodak warning clear in my mind & spent as little time as possible looking through the camera viewfinder at partial phases.

My technique is to focus quickly then stop down my 500mm f4 lens with 2x teleconverter from f4 to f16. I don't look through it again until totality. If I do want to look at some sunspots, I stop the lens down to f45(f90 with the teleconverter) and look but still not for extended periods of time.

I must admit that the Baader is much nicer. Someone in this thread mentioned that the Kodak filters were much cheaper than other filters. In Australia, KODAK ND 4 filters retail at around USD30 for a 3in x 3in piece. You get an A4 size piece from Baader for the same money and a 500mm x 1000mm sheet for USD 70. You have to add the Astrophysics USD25 freight charge to the Baader prices. A large piece of Baader split between members of a club is much cheaper per unit area than KODAK wratten filters and visual safe. A 3x3in piece would work out to a couple of dollars. Baader comes in a 3.8 and 5.0 densities. Unless you are doing photography only with really slow film(2415) or high EFR's, I suggest you don't buy the 3.8. It transmits too much light for photography with medium speed film and fast lenses.

Using fully developed B&W film as solar viewing filters. We should as a group probably begin to move away from this old "reliable" method. Film manufacturers have been reducing the silver content of B&W film for many years(T grain technology eg TMAX films). The metallic silver was the protective component. Another complication is that film marketed as KODAK "Black & White" in Australia is actually chromagenic film. The net result is that this method is not nearly as safe as it once was.

As far as I can see, old formulation plus X pan or Tri X pan professional developed in HC110 dil B are probably the only two films that you could be certain of any more without testing. Kodak was going to discontinue these films in 2002 but recently announced their continuation due to their popularity with fine art photographers. Some silver reduction in the emulsions might take place. It would be interesting to measure some TMAX100 film or better yet some 100TMAX as that's the new formulation that will be commonly available from now on, TMAX100 is being phased out from 2002 & replaced with 100TMAX.



## SETalk

**Questions about polymer eclipse viewers**

From: Claire Flanagan To: SOLARECLIPSES@AULA.COM Date: Mon, 28 Oct 2002 18:53:02

I've heard two worrying rumours about the polymer used in eclipse viewers - can anyone on this list authoritatively confirm or deny them?

- 1) the polymer degrades with exposure to sunlight (i.e. with use)
- 2) use of polymer-fitted viewers has been banned in some countries



Thanks Claire Flanagan 111flan@cosmos.wits.ac.za Johannesburg Planetarium

From: Jay.M.Pasachoff@williams.edu

After several safety-related postings and the query about use of Kodak Wratten-brand gelatine filters, I referred the postings to Dr. Ralph Chou, the professor of optometry who is an expert on eclipse filters and safety. Jay Pasachoff

Here are his responses:

I do not have my curves posted anywhere except of Fred Espenak's and Sky and Telescope's webpages. I can tell you that the Wratten ND filters do not attenuate IR nearly enough to meet the requirements of the solar filter Technical Specification. A combination of Wratten ND filters that would meet the IR transmittance requirement would block too much visible light for a usable image to be formed.

I would not trust anything in a newspaper report when it comes to recounting how people incurred eclipse related eye damage. The 10 second observing time flies in the face of both research on experimentally induced retinal burns with bright light sources and the calculations that can be done based on the retinal irradiance levels, known imaging properties of the eye and models of heat dissipation in the irradiated retinal tissue.

Unfortunately, there are few detailed studies of retinal injuries following solar eclipses. There are several that are quoted in the literature, mostly arising out of eclipses that occurred over the United Kingdom in the past few decades. The most recent study is the Keightley survey in 1999-2000, details of which I have already sent you.

David Finlay asks some interesting questions in his post.

1. If an ophthalmologist detected retina damage of this type would they be able to relate it back to the patient watching an eclipse?

With appropriate questioning of the patient, probably yes. The appearance of the damage is characteristic. Also, the patient is likely to have already suffered some loss of vision, which would have caused the patient to seek the consultation in the first place. However, the reliability of the patient's account of the circumstances leading to the injury would be highly suspect. Patients are very poor at remembering how long they stared at the sun, in my experience.

2. Would the patient know that was how they received the damage?

There is a characteristic "latent time" between when the retina is damaged by light, and the time that the visual symptoms become manifest. Typically, the loss of vision is noticed the morning after the event. It is likely that someone who has incurred an eclipse related eye injury will make the connection. On the other hand, Keightley et al.'s data show that this is not always the case. One patient apparently did not seek attention until months after the event.

There is no national reporting system for eclipse-related eye injuries anywhere. Any attempts to gather such information (e.g. my own study after the 1979 February 26 eclipse in Canada and the USA) usually do not enjoy a great deal of success. Unfor-

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Unfortunately, most such studies are retrospective, and busy emergency wards and private practices simply don't keep good enough records for useful, reliable information to be harvested.

Please feel free to post this back to the Solar Eclipse Mailing List. It may provoke some interesting discussion. Ralph

From: Alyn Kelley

some anecdotal evidence: after viewing the recent partial SE in San Francisco using my "eclipse glasses" (the paper glasses I purchased the year before in bulk for the trip to Zimbabwe), my eyeballs had an uncomfortable "hot" feeling. I would have brushed that off as psychosomatic except for the fact that my friend, also using my glasses and not knowing that I was experiencing that, also reported the same feeling, and reported having new blind spots in her eyes the following day. I haven't checked to see if she still has them or not.

neither of us looked through the glasses for very long periods, as far as I can remember. It's possible that there was damage to the lenses that was not visible to the naked eye, although it's hard to imagine that I wouldn't have seen such damage while looking right at the sun.

Is it possible to have damage to the glasses that's not visible to the naked eye, even when looking through them at the sun? Is there something I should have been doing differently? Is there an obvious "safest viewing" choice when trying to protect one's eyes? thanks, Alyn

From: Fraser Farrell

To all, I have appended some medical journal abstracts on this topic, courtesy of the PubMed online database ( [www.ncbi.nlm.nih.gov/PubMed](http://www.ncbi.nlm.nih.gov/PubMed) ). I got 64 matches for the search term "solar eclipse"; most of which are relevant. cheers, Fraser Farrell

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Exposure to a solar eclipse causes neuronal death in the retina. Thanos S, Heiduschka P, Romann I. Department of Experimental Ophthalmology, School of Medicine, University of Munster, Germany. [solon@uni-muenster.de](mailto:solon@uni-muenster.de)

**BACKGROUND:** A solar eclipse was observed in Europe on 11 August 1999. Several individuals suffered from transient or persisting retinal damage, caused by gazing at the eclipse without adequate eye protection. Retinal damage is the most serious hazard of exposure to light. but the mechanisms by which this type of exposure produces retinal damage and its cellular correlates are not yet established. We used an animal model to monitor the mechanisms of retinal damage following excessive light exposure, and in particular to study whether observation of the eclipse induces death of retinal cells.

**METHODS:** In the geographic area where the experiment was conducted, a partial (90%) solar eclipse was observed. Experimental albino rats were exposed to these eclipse conditions, and control rats were exposed to normal sunlight. Another group of control animals was exposed to the same conditions, but was provided with protective light filters of the type recommended for human use. The DNA fragmentation in retinal sections of the various groups was analysed by terminal deoxynucleotidyl-transferase-mediated dUTP nick-end labelling. This analysis revealed that exposure to both normal sunlight and to the eclipse resulted in neuronal apoptosis. Immunohistochemical techniques were used to evaluate possible glial-vascular alterations.

**RESULTS:** Dying cells could first be detected 24 h after exposure, the largest number of which were found 6 days later in the photoreceptor layer. Control levels were attained 14 days after the exposure. Retinal ganglion cells underwent apoptosis in both groups (normal sunlight and eclipse exposure), whereas in the neuroglial cells there was an up-regulation of the intermediate filament content. The number of dying cells in both groups was greater in animals whose pupils had been dilated pharmacologically during exposure. On the other hand, the protective filters were effective in preserving the rat retinal cells from apoptosis.

**CONCLUSIONS:** These results show, for the first time, that the cellular correlates of solar retinopathy are neuronal apoptosis accompanied by glial-vascular responses. Cellular apoptosis is an irreversible process, which could manifest itself as permanent visual impairment. The activation of non-neuronal cells, such as glial and endothelial cells, could be responsible for the more

*(Continued on page 33)*

## SETalk

transient clinical symptoms.

[additional conclusion by FF - rats notice partial eclipses too!]

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Eclipse retinopathy. Michaelides M, Rajendram R, Marshall J, Keightley S. Department of Ophthalmology, Queen Mary's Hospital, Sidcup, Kent, UK. drmichelmichaelides@hotmail.com

**PURPOSE:** Solar retinopathy is a well-recognised clinical entity of macular damage caused by viewing the sun, induced by a photochemical process. The term 'eclipse retinopathy' is frequently employed when the condition is sustained as a result of viewing a solar eclipse. Considerable public excitement had been raised in anticipation of the full solar eclipse on 11 August 1999. Whilst experience has shown that visual morbidity is likely to be temporary, current evidence is anecdotal and restricted to isolated case reports and series. This study was conducted to establish the true visual morbidity associated with a solar eclipse, and whether it was temporary or permanent.

**METHODS:** A 3 month active case ascertainment study was carried out from July to September 1999 to record cases presenting to ophthalmologists with visual symptoms arising from solar viewing. Further information about the cases was sought using a short questionnaire. A follow-up questionnaire requesting outcome data at 6 months was also employed.

**RESULTS:** There were 70 reported cases of visual loss. The average age was 29.5 +/- 12.9 years. Half the cases presented to an ophthalmologist within 2 days of the eclipse. An abnormal macular appearance was reported in 84% of patients at presentation. There have been no reported cases of continued visual loss or symptoms at 6 months.

**CONCLUSIONS:** This is the largest nationwide study of the visual effects of a solar eclipse ever undertaken. There were no recorded cases of permanent visual loss, which corroborates the previous evidence that visual morbidity is likely to be temporary. It would appear probable that public health education was most effective in reducing visual morbidity and hence keeping the consequent burden on the NHS to a minimum.

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Eclipse burns: a prospective study of solar retinopathy following the 1999 solar eclipse. Wong SC, Eke T, Ziakas NG.

Looking at the sun can cause focal burns to the retina. We prospectively followed up all patients who presented to Eye Casualty of Leicester Royal Infirmary having observed the solar eclipse of August, 1999. 45 patients attended, of whom 20 had visual symptoms and five had visible changes in the retina; four patients were still symptomatic after 7 months.

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Solar retinopathy. A study from Nepal and from Germany. Rai N, Thuladar L, Brandt F, Arden GB, Berninger TA. Kathmandu Lens Clinic, Nepal.

319 patients with a solar retinopathy were seen in an eye clinic in Nepal within 20 months. All patients had either a positive history of sun-gazing or typical circumscribed scars in the foveal area. In more than 80% of the patients the visual acuity was 6/12 or better and did not deteriorate over time. 126 (40%) patients had a history of gazing at the sun during an eclipse, 33 (10%) were sun worshipers and 4 (1%) were in both categories. Three years later 29 patients were re-examined in a follow-up study. Only 16 had had visual disturbances directly after they had gazed into the sun. No colour vision defects were seen in any of the 44 affected eyes, when tested with Panel D 15, while four patients (6 eyes) had some uncertainty with the tritan plates of the Ishihara test charts. Metamorphopsia were recorded in 11 eyes. Five German patients with solar retinopathy were examined in more detail. Colour contrast sensitivity (CCS) was tested for the central and the peripheral visual field. CCS for tritan axis was raised in all patients for the central visual field, while it was normal for the peripheral visual field.

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Solar retinopathy in a hospital-based primary care clinic. Stokkermans TJ, Dunbar MT. Bascom Palmer Eye Institute, Miami, Florida, USA.

*(Continued on page 34)*

## SETalk

**BACKGROUND:** Most reports of solar retinopathy describe epidemics of patients who go to the eye doctor after viewing a solar eclipse. Rarely is it encountered by the primary eye care provider during a routine eye examination.

**METHODS:** For 26 months, patients who went to the primary care eye clinic and found to have macular lesions consistent with solar retinopathy were identified from the total clinic population. These patients were documented in a coded log and fundus photographs were obtained (when possible).

**RESULTS:** Twenty-six eyes of twenty patients (0.14% incidence) were determined to have macular lesions consistent with solar retinopathy. Visual acuity was 20/25 or better in 100% of the patients and 85% were 20/20. Patients were predominantly men (75%) of middle age (average age, 43 years; SD, 11 years) with a history relevant for solar retinopathy (80%)--consisting of sungazing, 60%; looking at welding light without eye protection, 15%; substance abuse, 15%; and psychiatric condition, 5%. Forty percent had solar lesions in both eyes. Amsler grid testing revealed a defect in only 20%, and macular threshold visual-field testing was normal in all the eyes tested.

**CONCLUSIONS:** This is the first report to characterize solar retinopathy in a primary eye care population. Management includes correct differentiation from other macular disorders, acquisition of a careful detailed history, and provision of patient education regarding the dangers of sungazing.

From: Starfield Scientific

Not knowing the exact conditions of this event I find it difficult to comment, however I will add that I have been using Rainbow Symphony eclipse shades for the last 10 months without any problems.

In fact I use them every day to look for (filtered) naked-eye sunspot, of which there has almost constantly been some visible over that time.

At lunch I take a pair of eclipse shades with me and quite often relax by staring at the sun through them. It would be no exaggeration to say that I spend 10 minutes every day doing this.

If they weren't safe I wouldn't sell them, let alone use them so regularly myself.

I have noticed that when giving other people a look through my shades they feel uncomfortable and need to look away. This is due to full sunlight directly on whole of their face. It appears to me that there may be a natural protective reflex that makes us squint when this happens, that is independent to how much light we receive through our eyes. It feels uncomfortable at first but only takes a few minutes to get used to.

Also if you look up at the sun with the eclipse shades immediately after being indoors it can feel uncomfortable. The shades do still let through a reasonable amount of light and with the pupils fully dilated it may seem at first that the eclipse shades aren't working as well as they could.

I would be interested to know if there was any permanent eye damage that could be confirmed by an ophthalmologist from the event described by Alyn.

>From my previous letters you can probably tell that I am fairly passionate about eyesight damage, and in particular eclipse blindness.

As a young child I had a game where I would stare directly at the sun until my eyes watered and I had to look away. In the end I got so used to it I could stare at the sun indefinitely. My logic was that if the sun was dangerous to look at, and it was always up there during the day, then someone would say that it was dangerous, which they never did.

I don't know if I was just lucky, or if my eyes were able to recover from the damage at a young age, but I find it very hard to stare at faint galaxies and nebula. I use averted vision much more than the other people in my astronomy club, and when my eyes are extremely well dark-adapted I can almost see a dark patch in the middle. Perhaps this is common for everyone...I'm

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## SETalk

not sure. But I do wish someone had warned me about the dangers of staring at the sun when I was a kid. David Finlay <http://www.starfield.com.au>

From: Michael Gill

In addition to Fraser's list of eclipse retinopathy references, there is one fully viewable online (requires Adobe Acrobat Reader) from Elazig, Turkey. One hundred and eighty nine patients presented themselves for ophthalmic examinations following the August 1999 TSE. Nine patients (11 eyes) were found to have solar retinopathy:

<http://journals.tubitak.gov.tr/medical/issues/sag-02-32-5/sag-32-5-7-0203-8.pdf>

A study of the June 2001 TSE in Madagascar can be seen at this URL:

[http://www.jceh.co.uk/journal/42\\_5.asp](http://www.jceh.co.uk/journal/42_5.asp)



In my opinion the highlight of the above study is the following extract: 'One young villager was less concerned about his own eyes than those of his cattle or the lemurs in the rainforest. "Who will protect their eyes? They do not understand like us", he asked with a blank expression.'

Incidentally, when looking at the following abstract about the 1999 TSE in Iran...

<http://www.vrs-online.com/2001/abstracts/58.html>

...I noted the following statement: "People may injure their eyes by observing and gazing on the sun during an eclipse unless they take the precautions of only looking at the image reflected in the water or medium."

Since staring at a bright sun either directly or via a reflection is not exactly best practise, I wonder if safety warnings by some eye specialists prior to the August 1999 TSE might have contributed to the problem? Michael Gill

From: KidinVS@aol.com

I have seen 7 total eclipses, and have used Rainbow glasses since 1993. I find the orange image through the polomar material very comfortable to look at. I must have a cumulative time of over 100 minutes using the glasses, and I think my eyes are fine. I have dispensed over 10,000 pairs of glasses, and have never heard back from anyone of problems. See you in Zimbabwe... Rick Brown [www.eclipsesafaris.com](http://www.eclipsesafaris.com)

From: Jay.M.Pasachoff@williams.edu

A problem with the glasses, in my view, is that people tend to put them on and wear them for a long time. I therefore prefer the cards that have a cutout with filter material in it that you hold up to one eye with your hand. That tends to keep people from staring, always an extra modicum of safety, and also is all that is needed, given the slow rate at which a partial eclipse changes. I am sorry to see the almost complete morph to eclipse glasses over the last few years.

Given the rampant misuse and understanding of everything, I think that any filter--glasses or not--should have very brief instructions printed on them. I think they should be called "partial-eclipse glasses" since they aren't for use during totality, so they shouldn't be called "eclipse glasses." "Glasses for use during partial eclipses" or "...during partial phases of eclipses" might be even clearer. These few words should be printed right at the top of the glasses; people won't read accompanying sheets of instructions. A line saying "remove during the total phases" would be a helpful addition, or a sentence saying "these glasses are too dense to permit viewing the total phase of a solar eclipse" would be more detailed. Again, these words should be printed on the glasses or other cardboard. Jay Pasachoff

From: Bill Kramer

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## SETalk

Another problem with eclipse glasses is that they tend to get bent or damaged when packing. This increases the chance of cracking the thin film. I have also seen kids put them on and then go running around playing a form of blind man's bluff game.

I've used eclipse glasses in the past and still prefer the view through a small telescope with a proper solar filter. For sharing the partial eclipse experience a properly set up and maintained projection is wonderful.

In my experience it seems that the best use of the silver reflective type are for group photographs after the eclipse! Bill Kramer  
[www.eclipse-chasers.com](http://www.eclipse-chasers.com)

From: Mike Murphy

During the partial phase before the 2001 TSE in Zambia I was wandering around the little hill we were on, chatting with the various observers there, many of them with serious bits of kit set up.

One chap had a an SLR camera on a tripod but seemed to have no filter of any sort on the lens. As I watched, he put on his cardboard eclipse glasses and proceeded to look through the viewfinder of the camera to line it up on the Sun! I could not believe it. I interrupted him and mentioned that what he was doing was very dangerous and could quite probably result in permanent damage to his eye, especially if the focussed rays managed to melt the thin plastic of the eclipse shades. He then produced from his pocket a pair of eclipse glasses with little holes melted in the plastic. My gasp has never been so flabbered.

I repeated my warning, adding that he may well not feel any damage and his response was, "Well, how do I line up the camera then, I won't be able to get any pictures unless I look through it".

After saying that I'd rather keep my vision even if it meant losing a few pictures he seemed to get the message. Perhaps the fact that I had a British Airways eye cover on one of my eyes with blue PVC tape plastered over it (to dark adapt one eye) had an effect on him as well. :- ) - Mike wishing he was going to see the Dec 4th TSE.

From: barr deryll

The idea of using the eclipse shades at the focal point of a camera or even binoculars seems to be relatively common. In Mongolia in 1997 when we were preparing our equipment the evening prior to the eclipse several of us noted that one group member had a pair of 7X50 binoculars with apparently no aperture filter. When we questioned this individual about his plans, he explained that he proposed to observe the partial phases with the unfiltered binoculars while wearing a pair of mylar eclipse shades. He seemed quite offended when nearly to a man and woman everyone else in the group in varying degrees of descriptive detail tried to explain the folly and possible consequences of his plan. Defiantly he announced that he was going to stick to his original plan. At least someone benefited from being clouded out.

From: Fraser Farrell

I've recently added a few simple diagrams to my eclipse lectures. These are drawn thus:

### 1) SAFE DIRECT VIEWING METHOD

partly-eclipsed SUN --> Solar Filter --> eye/camera/bino/scope

- 'ALWAYS FILTER FIRST' -

### 1a) SAFE DIRECT VIEWING METHOD for the few seconds of TOTALITY ONLY

TOTALLY-eclipsed SUN --> eye/camera/binocular/telescope

### 2) UNSAFE VIEWING METHODS include:



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## SETalk

partly-eclipsed SUN --> homemade 'sun filter' --> eye looking through 'filter', going blind

partly-eclipsed SUN --> pinhole --> eye looking through pinhole, going blind

partly-eclipsed SUN --> eye looking directly, going blind...

partly-eclipsed SUN --> camera/binocular/telescope --> any filter whatsoever, or no filter --> an idiot who's just been instantly blinded...

Looks better on a whiteboard, but that gives you the general idea.

He was probably afraid it was covering your hideously sun-cooked eyeball, and that you were about to make him lose his lunch from looking at it :- ) cheers, Fraser Farrell

From: Mike Murphy

Hi Fraser, yes, he may well have thought that and it didn't occur to me that he may have, until afterwards. I don't think anyone had had lunch at that point - too excited about the darkening sky - but we did manage to sink a few Castle lagers. Cheers - Mike



### Transits of Venus website

From: stephen johnston To: HASTRO-L@LISTSERV.WVU.EDU Date: Fri, 11 Oct 2002 20:13:23

Apologies for cross-posting

The Scientific Instrument Commission (SIC) of the International Union of the History and Philosophy of Science has announced a project to create a collaborative website devoted to the Transits of Venus.

Could you play a role in shaping this important new resource?

The Transits were key events in the international development of science. The project will bring together information and images from historical transit observations - instruments, illustrations, photographs, people, expeditions, and sites - to create a database drawing on as wide a range of sources and repositories as possible.

We are seeking a small group of partners to take part in the project's initial development. This will involve providing digital materials and contributing to the testing and refinement of the web site.

Partners should ideally represent collections with Transit-related materials, whether artefacts or archives. We would hope to work closely with at least one individual from each partner in developing the detailed site design. The technical development will be carried out by the University of Oxford's Academic Computing Development Team.

The software development will begin early next year but we would like to begin discussions with initial partners as soon as possible. The public website will be launched in Autumn 2003 and we hope that it will then gather further materials and contributions to create a major resource before the next Transit in June 2004.

To register an interest or seek further information please contact one of the three members of the SIC working group:

Stephen Johnston Museum of the History of Science, Oxford [stephen.johnston@mhs.ox.ac.uk](mailto:stephen.johnston@mhs.ox.ac.uk)

Sara Schechner Collection of Historical Scientific Instruments, Harvard [schechn@fas.harvard.edu](mailto:schechn@fas.harvard.edu)

Steven Turner National Museum of American History, Washington [turners@nmah.si.edu](mailto:turners@nmah.si.edu)

## SETalk

**Young Moons**

From: Rybrks1@cs.com To: btafreshi@nojum.net SOLARECLIPSES@AULA.COM Date: Wed, 02 Oct 2002 09:36:15

Dear Babak, Thank you for your response about Youngest Moons after eclipses.

Your two reports are wonderful! (even though not after an eclipse) I have entered them into my tabulation below.

The separation of Moon/Sun is the same for Nezhad and Mir Saeed, 7.7 degrees. This separation is the topocentric separation at the site of the observer. It is the angle from Observer to Sun to Moon. The classic geocentric separation listed by others of Center of Earth to Sun to Moon is much less meaningful to the observer. The observation by Stamm is 7 minutes younger but it is a fatter crescent.

The Sept 7 2002 recording is a younger observable moon than Aug 19 2001 only because its new moon was 28% farther from the Sun than the new moon was for Aug 2001. I am certain that the astronauts can see a new Moon while it actually is new, meaning approx 5 degrees separation or less. Only a few degrees away they should be able to see the Earthlit darkside of the Moon. I should email them and ask them that while they are in the International Space Station (ISS).

I personally talked to both of the last two astronauts on the Moon. They said there were more stars with the darkest sky they ever saw even with the Sun in the sky at the time. They were comparing it to the darkest skies they remembered as a kid in the Rocky mountains. I told Astronaut Schmitt I was surprised to see him on the Solar Eclipse trip in 1991. He asked why. I said that if he had covered the sun with his finger he could have seen as many total solar eclipses as he wanted. He gasped, "Darn it, I never thought of that!" Sincerely, Raymond Brooks

From: Harvey Wasserman

My wife and I were swimming in the pool, either on the 7th or perhaps it was the 8th of Sept, when I saw the new moon close to the horizon. I thought that it could not be more than 3 days old, and felt at the time that it was the slimmest moon I had ever seen, and was presumptuous enough to think that it was only 2 days old. Is that even possible?

As I gazed at it, my wife, who recently became my wife after we viewed the 2002 eclipse from Zambia, mentioned to me how much it looked like an eclipsed sun just before, or just after totality. I looked again, and saw what she meant. The sky was too dark, but the horizon still had some of the sunset colors, and as I gazed at the moon, it was as if those few seconds before totality were suspended and stretched to eternity. I could easily visualize Bailey's Beads (sorry, spelling) and anticipate the corona. I was able to re-experience those feelings all over again. It was quite magical.

Thanks for letting me share, Harvey Wasserman

From: Robert B Slobins

In 1991 I photographed the crescent moon setting behind the mountains at San Jose del Cabo. I figure that the moon was 32-33 hours old. --Robert B Slobins

From: Klipsi

recent examples of post-eclipse young moons:

June 11 this year, observed from Los Angeles airport one day after the Puerto Vallarta annular eclipse  
<http://eclipse.span.ch/110602moon.jpg>

1998 feb 27, a day and a few hours after the Caribbean 1998 eclipse  
<http://eclipse.span.ch/Moon27Feb.jpg>



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## SETalk

feb 17 1999, a day and 4 hours after the Australian annular eclipse

<http://eclipse.span.ch/17fe99moon.jpg>

best regards, Klipsi

### **An incredible pinhole story**

From: Dave Balch, The Stay-at-Home CEO To: SOLARECLIPSES@AULA.COM Date: Tue, 29 Oct 2002 21:55:19

Here's an unbelievable story about using a pinhole device to view to partial (in Los Angeles) of June 10.

I was at the dentist and the hygienist, who knows about my affinity for eclipses, was telling me that her eyes hurt after viewing the partial eclipse on June 10. I told her that she shouldn't be looking directly at any partial phases, and that it is only safe a few seconds before totality. On June 10, she should be looking through special glasses, blah, blah, blah.

She told me that they were using a piece of cardboard with a pinhole, but that she couldn't look for very long because it was hurting her eyes. As it turns out, SHE WAS LOOKING DIRECTLY THROUGH THE PINHOLE AT THE SUN!!!

I told her that the pinhole was supposed to be used to PROJECT an image onto another surface; she looked pretty embarrassed, but relieved that she didn't really hurt her eyes.

I think that the ONLY thing that saved her eyes was the fact that it was hazy and the sun was only at about 25 degrees.

...and she cleans my teeth with sharp instruments...

From: Evan Zucker

Unfortunately, it's not at all unbelievable. I think it this is actually pretty common, no matter how much we try to publicize the correct way of using the pinhole. -- EVAN

From: Starfield Scientific

Sounds exactly the same as what the gent at the astronomy festival described to me regarding the 1945 eclipse. However he didn't look away and ended up with the "fried egg" eyeball that I have described previously.

I notified the Department of Human Services in South Australia that when they issue their safety statements about the eclipse, they shouldn't just mention the pinhole method, they should describe it completely so that people don't get the wrong idea.

Many people have told me they thought the pinhole method was to look right through the hole. It appears to be a common misconception. David Finlay <http://www.starfield.com.au>

From: Fraser Farrell

> I notified the Department of Human Services in South Australia that when they issue their safety statements about the eclipse, they shouldn't just mention the pinhole method, they should describe it completely so that people don't get the wrong idea.

They seem to be scared to death of lawsuits if they offer any observing advice other than DONT LOOK.....sigh....

When Janita and I put together ASSA's eclipse brochure, she included cartoons of the correct way to do the pinhole method. And this information is Out There. The 2000th download of this brochure from my webserver occurred late yesterday. I don't have the figures for ASSA's website; but probably much higher from there.

The science/technology education centre ([www.investigator.org.au](http://www.investigator.org.au)) in Adelaide has also distributed hundreds of copies of this

## SETalk

brochure since my public lecture there last Wednesday. I made it pretty clear to the kids and their parents that there were a few -safe- ways to view a solar eclipse; which I described carefully. I also mentioned lots of stupid ways including that Vanessa Carlton video....in tones of contempt. The younger kids probably think I'm going to personally whack their bums on Dec 4 if they don't use safe viewing techniques ;-)

One lad asked me what would actually happens to his eye if he looked at the partial phases through his Tasco? My answer was a very detailed description of the demo I used to do for schools; using an unfiltered 60mm refractor and a sheep's eyeball at the eyepiece. Concluding cheerfully '...but even after all this permanent and irreparable damage, there's -still- no pain. Although you're already blinded for life... The pain only begins around the 20-25 seconds mark, when you burn right through the back of your eyeball into the surrounding tissues. Or, after another 50-60 seconds, when the eyeball fluid that hasn't leaked out already begins to boil...inside your eye socket...'

I had to stop at that point because his dad was looking quite ill. cheers, Fraser Farrell

From: Jay.M.Pasachoff@williams.edu

Note that a similar problem occurs with people who try to observe an eclipse using a CD as a metal-deposited filter. Some people look through the CD's hole! Further, I have heard of people misinterpreting the statement that exposed x-ray film can be used as a safe solar filter. They look through the bones--the light part. So when I describe the pinhole method, I try to stress that you face away from the Sun. And when I describe using film, I mention that you use the dense part. Jay Pasachoff

From: Geert Vandenbulcke

Hi, 36 years ago, I experienced my first partial eclipse on 20 May 1966 when I was 13 years old, we were at school and the teacher took the whole class outside to look at the eclipse. We all looked through a small pinhole pierced in white paper and I remember I saw just nothing because it was too bright... No adverse effects were left except an interest in astronomy ;-)), saw three totals, one annular, missed one total due to cloud and gone try another total in SA next month. Best regards, Geert Vandenbulcke

From: Glenn Schneider

THREE ITEMS:

>...using an unfiltered 60mm refractor and a sheep's eyeball at the eyepiece...

1. Fraser: PLEASE tell use the eyeball was still not in the sheep at the time of this experiment! I am not a PETA-like animal rights extremist, but boiling the eyeball of a sheep in situ would be a bit much in my opinion even for the cause of an eclipse. Tell me the rest of the animal had been stewed and served for supper first and the eyeball was a "left over". I'll sleep better. I don't want this thread to digress, but sometimes my 8-year old daughter reads SEML posts (with just a little encouragement from her Das) and the idea of an eyeball boiling out of a sheeps head is, well, a bit discomforting.

and...

> When Janita and I put together ASSA's eclipse brochure, she included cartoons of the correct way to do the pinhole method. And this information is Out There. The 2000th download of this brochure from my webserver occurred late yesterday. I don't have the figures for ASSA's website; but probably much higher from there.

2. Cartoons may indeed be the best way to convey this information - as they will reach the intended audience with clarity. By cartoon, of course I mean demonstrative illustration. In fact in 1980 the Kenyan government produced one of the BEST information flyers I have ever seen regarding eclipse viewing safety. It was (if memory serves me correctly) a four page newspaper-like flyer - illustrated as a cartoon story like in the Sunday papers, called "Missionary Joe Explains the Eclipse" or something very similar. >From panel to panel, with very simple, but correct and informative illustration Missionary Joe tells of the eclipse to a Massai boy. (The intent here was not just to get the information to those in the urban areas but to the rural and tribal popu-



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## SETalk

lace in the bush). This SHOWED how to view the partial phases with pinhole projection \*AND\* did a wonderful job delineating between the partial and total phases of the eclipse - and appropriately strongly advised people to err on the side of caution BUT not to miss the opportunity to see the eclipse - particularly those in the path of totality. My memory of this may be slightly clouded (no oblique reference intended) as I do not, unfortunately, have a copy. But if anyone here does I would love to see it again - and it may serve as a good model, with an appropriate cultural shift, of the right way to do this.

3. Though I may sound redundant, as I voice this before every TSE, I do see some "new" names on SEML, so old-timers bear with me. In a group of people, I find the BEST way to view the partial phases is to use "reflected pinhole projection". Use a small optically flat first-surface mirror, like a secondary mirror from a small Newtonian telescope, to reflect an image of the sun over a long distance onto a shaded white "screen". People will cluster around and it fosters discussion as it becomes a "social event" rather than an individual one. As long as the angular size of the mirror as seen from the screen is smaller than the angular size of the sun a reasonable image will be formed. By decreasing the angular size of the mirror at the screen - by covering part of it, or moving it further from the viewing screen, the image of the Sun will become sharper - but of course dimmer. It is a trade between sharpness and contrast. This is exactly the same trade you make with a transmissive pinhole, i.e., make the pinhole larger to get a brighter, but fuzzier, image, unless you move the screen further away and again gets fainter in surface brightness. It also gives you the opportunity to explain some fundamental optical principles, AND no-one has to look at the Sun if they feel uncomfortable doing so, directly or indirectly. The only advantage of this method over a transmissive pinhole is that you can project an image a large distance away and many (i.e., hundreds) of people can view it at once. Of course, I always take down such a mirror before totality and remind people to observe the total phase directly. I would hate to be the cause of someone staring at a dark blank screen instead of the corona. Glenn Schneider

From: Bob Morris

The real problem with the media trying to give instructions regarding how to safely watch a total eclipse, is that the mass media, almost without exception, simply don't understand the difference between watching a total eclipse from inside as opposed to outside the path of totality, and if inside the path, the fact that the observation rules change during totality.

Hey, how can an eclipse be touted as being total if it isn't total?

Partial eclipses are partial for everyone but total eclipses are only total if you are in the path of totality, and then only for a short time.

Pretty simple, eh? Not!

(The preceding line is in Canadian.)

Add to that the task of ensuring that each of those who read their information understands whether they will be viewing from inside or outside the path, and you have a virtual impossibility.

So the solution that ensures no lawsuits: tell your readers "don't watch the eclipse" or watch it on TV.

With us, eclipse viewing is second nature.

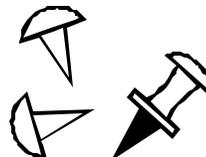
When I took my wife to Aruba, I simply announced "glasses on", "glasses off." Bob Morris

From: Evan Zucker

>So the solution that ensures no lawsuits: tell your readers "don't watch the eclipse" or watch it on TV.

Plus it boosts ratings! -- EVAN

From: Fraser Farrell



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## SETalk

>Tell me the rest of the animal had been stewed and served for supper first and the eyeball was a "left over". I'll sleep better.

More likely turned into lambchops and barbecued...but you can assure her that the eyeball was definitely not in situ. I used a teaspoon to hold it at the eyepiece.

A sheep's eye is generally similar to the human eye; therefore a good choice for this demonstration. However it is a messy demonstration for a group, even if halted after a few seconds. Someone in the audience is almost certain to have a delicate stomach!

>From panel to panel, with very simple, but correct and informative illustration Missionary Joe tells of the eclipse to a Massai boy. (The intent here was not just to get the information to those in the urban areas but to the rural and tribal populace in the bush).

We have a similar challenge here, and not just in the outback tribal communities. About 1/4 of the Australian population was born somewhere else and many of them don't have English as a first language.

>I find the BEST way to view the partial phases is to use "reflected pinhole projection".

One source of first-surface flat mirrors is dead photocopiers and scanners. A typical A4 copier contains a mirror approximately 220mm x 10mm. Plus a few lenses.

An ordinary CD-ROM works quite well too, if it's stopped down to provide a flat mirror surface. A simple way to do this is as follows:

- Fold an A4-sized piece of paper (or manila card) in half.
- Use an office paper hole-punch to make a hole near the -folded- edge of your paper. Most hole-punches will make a pair of holes but that does n't matter. Mine produced 6mm diameter holes.
- Slip your CD-ROM into the folded paper so that one of the holes has the shiny side of the disc showing. Staples or sticky tape can be used to secure the disc inside the paper.
- Position in sunlight, and cause the reflected image to fall upon a shaded light-coloured surface. Mine produces an image ~60mm diameter on a surface ~5 metres away, which is enough to discern large sunspots.

You will get a double image because there is a reflection from the disc surface as well as its aluminium layer. This can be alleviated by projecting back toward the sun's direction. I also found that Pink Floyd's 'Dark Side Of The Moon' produced a noticeably brighter image than an AOL disc. And for that 70's Disco Effect use one of the coloured CD-R or CD-RW discs instead ;-)

I've deliberately minimised my public discussions of traditional telescope projection methods; mainly because there are so many ways to hurt yourself or others when trying it. In addition a lot of the cheap new telescopes favoured by the 'occasional astronomers' have plastic eyepieces & focusers. Which don't last long when subjected to focused raw sunlight!

Of course, all of these optical projection methods require constant supervision if done for a group. cheers, Fraser Farrell

From: Michel-André LEVY

Do you speak that way to your wife only during solar eclipses or also in other circumstances ? Maybe I have a nasty mind but .... hmm ... no, I'd rather stop here, I don't want to be "off topic". Michel-Andre Levy

## SETalk

**Count down timer and time sync**

From: Vic & Jen Winter - ICSTARS Astronomy To: SOLARECLIPSES@AULA.COM Date: Fri, 25 Oct 2002

I've posted the code to our website for the count-down timer on the front page of [www.icstars.com](http://www.icstars.com) I am certainly open to criticism as to the accuracy of the timepiece. Unfortunately, I reside in the same timezone as the web server where the web page is being hosted (in CDT). I am concerned that the time being displayed may be affected by the user's individual computer clock, and how it might make the tool inaccurate outside of the CDT time zone.

I have the script set for a 2nd contact time of 4DEC, 2002 - 08:38:30 UT Please advise if this is or is not accurate in other time zones.

Unfortunately, I can't run more than one script applet on one page simultaneously, or have two pages open with the same script running at once. In order to have multiple countdown clocks configured, I'll have to make separate windows for each request for a countdown clock.... like a set of links: "Click here for viewing in Shingwedzi." or "Click here for viewing in Ceduna." or something of the like. It wouldn't be too hard. If anyone wants me to program a link for their location, I will be happy to, but please email me privately, rather than via the SE group.

[www.worldtimeserver.com/atomic-clock/](http://www.worldtimeserver.com/atomic-clock/) This is another wonderful tool, free to download to your machine not just for time and time zone functions, but it has a "ping" feature which will sync your computer clock to an atomic clock on command. Once I installed the software, I have pinged the atomic clock perhaps 10-20 times and it has reported that a correction was not necessary to date in the 3 months I've used it. We have found it much more accurate than GPS times. I've not compared it to the time cube yet. I hate that thing. Jen Winter - Owner

From: Dribalz@aol.com

webmaster@icstars.com writes: I've not compared it to the time cube yet. I hate that thing.

What is a time cube? Andrew Hans

From: F.Podmore

I have two questions following Jen Winter's posting:

1. I thought GPS time was extremely accurate, being linked to several atomic clocks somewhere. Is [/atomic-clock/](http://www.worldtimeserver.com/atomic-clock/) really 'much more accurate'?
2. What is 'the time cube'?

[I think this is relevant to eclipses as folk want to synchronise their observations as accurately as possible, and I thought GPS would do that just fine...] Francis

From: Glenn Schneider

> What's a time cube?

!!!! Now I \*KNOW\* I am getting old.

Other than your eyeballs, and maybe a telescope or pair of binoculars (and maybe a camera) the Time Cube - at the the ORIGINAL Time Cube was THE essential piece of equipment carries by UMBRAPHILES on each chase, quest, sojourn or whatever "term" you choose to use. And, I extend the use of UMBRAPHILE to those of us who froze our derrières off in damp cold dismal swamps long after the Sun dropped below the horizon chasing after asteroid shadows and lunar umbras from stellar sources as well.



## SETalk

The Time Cube - was/is a rather use-specific short-wave radio manufactured by Radio Shack. It was (and is, as I still have and use two of them - even in this age of GPS) about a 100cm cubical S/W (that's "short wave, not "software" for those too young to remember those days) radio with pre-tuned preset-buttons on the top front to receive, and only receive, WWV (and WWVH) at 5, 10, 15, and 20 MHz. With a simple long-wire antenna plugged into a jack in the back I had used it as my PRIMARY time reference over three decades while observing eclipses (and other activities) from all over the globe. Occasionally, from some locations, at some times, signals were weak and transitory, but typically peaked up after sunset so I could set clocks the night before an eclipse if needed, but most of the time it worked in situ as needed.

In 1988, for my second Indonesian eclipse I arrived in Jakarta to learn that (at least at that time) it was illegal to bring short-wave radios into the country - as I was challenged at immigration/customs on arrival when my baggage was inspected. My command of the local dialect was virtually nonexistent, and his English was on par with my attempts at communicating with him in his native tongue. I decidedly pointed to my wristwatch, shook my head vigorously from side to side while holding the Time Cube and said "NO RADIO, CLOCK, NO RADIO, CLOCK", pulled out the built-in antenna, clicked down the 10 MHz preset and to my relief heard the quite nicely audible once per second droning cadence of "beep, beep, beep" and "tic, tic, tic" before the reference coordinated universal time-hack was announced on the minute. He let me through! Though, in retrospect, that might have been because I had given him three solar filters and a couple of "Eclipse 1988" stickers as a token of my appreciative welcome to the country. Time Cubes rock. At least for us older foggies. Glenn Schneider

From: Glenn Schneider

The GPS system \*IS\* extremely accurate, quantumly re-calibratable to about 40 nanoseconds per day, and is absolutely tied to the fundamental reference provided by the world-grid of atomic time references. In past years I am sure I posted links to sites which discussed this in detail, and probably are buried in past issues of SENL with commentary. Though as I seem to be missing the SENL posting to which this is in reply I suspect you may be asking about network time servers, and propagation delays through computer networks (and how well they are compensated for?)

The basic "problem" is that for many (most) hand-held GPS receivers TIME is not a priority in the user-interface firmware and display, POSITION is. Hence, simply because of the interrupt structure and "task prioritization" consumer-oriented GPS unit internal software, the "information" is not provided to the user (you) in a timely fashion (no pun intended). Lab GPS, and higher end units can (and do), essentially, put the precision of an atomic time reference at your immediate disposal.

FYI - GPS is a dynamical time reference as the satellites are moving and as such the derived metrical time MUST be corrected for the effects of BOTH special and general relativity. I had a fairly detailed positing on this some time ago - BUT - a few months back (but after that posting) there was a VERY nice review article in "Physics Today" about the effects of STR/GTR on GPS derived time. Of course, your hand-held GPS unit is smart enough to deal with that - probably it knows more about GTR metrical theory than I do. But, the next time someone asks some impertinent question such as "yeah, well, tell me how Relativity is relative to my everyday life?", point to the talking NavStar system in his/her SUV and tell them without it they would be driving down the wrong street (or at least, at the wrong time).

What does this mean for "eclipse chasers"? IF your requirements for an absolute time reference is at the worst a second, then even the least costly, and older generation, GPS units will do nicely - and in the vast majority of cases - we really are taling about tens to hundreds of milliseconds.

> 2. What is 'the time cube'?

Answered earlier. Time from the Time Cube, is of course delayed by radio propagation AND can be time variable (by tens of milliseconds) as the wave goes from Ft. Collins to wherever you may be on the other side of the world. This problem is "solved" by using a WWVB receiver, which uses ELF (extremely long frequency) waves which propagate along the Earth-surface interface only (submarines, as I understand also use EFL for similar reasons, but am not knowledgeable about that). You still get the propagation delay because of the speed-of-light, but it is not time variable (at least to first order).

## SETalk

"True Time Instruments" used to make a great portable WWVB receiver. I don't know if they still do, or even if they are still in business. but someone must...

But now it is TIME for me to get back to work. Glenn Schneider

From: Dale Ireland

Hi GPS is the most accurate time signal you can receive. Unfortunately all consumer GPS units have time displays and outputs that are only accurate to +/- 1.0 seconds which is terrible. If you overlay WWV audio onto a video tape it will be accurate to about the frame length of the video .13s to .03s at best. WWV has a 100hz tone you can hear so that is about its best accuracy. There is one GPS unit, the Garmin GPS35 OEM, which has an output that resolves .001 seconds but it doesn't have a display and is used as a "component" in other complete systems such as the BlackBox time code inserter for video that I think has been discussed here on the list and can be viewed here <http://www.blackboxcamera.com/STV5730A/astro.htm> I have one that I use for occultation timing.

I have tested various internet time programs against WWV and you can usually get 1sec accuracy which is the same as the accuracy of the Windows Clock. Also, everyone's PC drifts by varying degrees. Mine is particularly bad, losing almost 1 second per day!

> 2. What is a timecube

I think that was something that Captain Kirk and Mr. Spock used to travel back in time Dale



From: Vic & Jen Winter - ICSTARS Astronomy

The time cube is the "other button" on your weather radio. Most people who have a weather radio don't even know that's what it does, since throughout the minute, it's just making click noises. Then, it says "at the tone, the time will be X hours, XXminutes - tone". Every now and then for seasonal celebrations, they give you a quack.

I don't know how often it's used in eclipse contact timings. That depends on the individual's purpose and accuracy goals. It could be used to determine 2nd and 3rd contact more accurately. I suspect limb profile affects these times in a much larger scale than time inaccuracies.

We still primarily use the time cube for Lunar-Occultations. If one is observing an event and recording timings, it's not possible to stop observing and look at a time clock, then go back to observing an event you need to record. An audible time cube and tape recording device work very well for timings like this.

The truth, however, is that a time cube is astronomers' chinese water torture. Here, we flash back to days gone by when trying to catch a ball-game on a transistor radio. The antenna flops, the signal wanes and in between static, one grasps glimpses of the desired time-sensitive information. If one wasn't annoyed enough, let's not forget the perfect and perpetual tocking. (It's not ticking, but tocking).

So this is the way to remember a monumental event in observing: You dragged an observatory-worth of equipment out in the field to catch the event. You're worried about everything working properly, your positioning, the dog nipping at your ankle.... Now, waiting alone in silence trying to eek out the monotone minute announcements, one eye to the eyepiece, one hand on the antenna for signal corrections as the event is creeping closer. The signal finally stabilizes leaving you there impatiently waiting for your event to occur - with nothing but minute after minute of "tock-tock-tock-tock-tock-tock-tock-tock"

"There's a fine line between Genius and Insanity." jen

From: Glenn Schneider

I have to disagree - it is music to my ears. Every once an a while I get a call (usually a dinner time) from a commercial

## SETalk

pollster asking me what my favorite radio station is. To which I always answer "WWV". Which leaves them quite perplexed, of course. -GS-

From: Fraser Farrell

Some information about the local time signals in South Australia; for those of you using radio-based gadgets...

VNG Australia broadcasts a shortwave time signal across the country from their transmitter near Sydney. Transmissions are continuous on 2.500, 5.000, 8.638 and 12.984 MHz. The typical minute of transmission is made up of:

- Short beeps (seconds 1 to 54 inclusive) of a 1000 Hz tone
- Short 'pips' or 'ticks' (seconds 55 to 58 inclusive). In minutes 5, 10, 15, 20 etc these 'pips' are broadcast for seconds 50 to 58 inclusive.
- silence (second 59)
- a long beep (second 0)

The change from Minute 2 to Minute 3, for example, sounds like '...beep beep beep pip pip pip pip [silence] BEEEEEP beep beep...'

In addition on VNG frequencies 2.5 & 5 MHz a female voice speaks the UTC time at the start of each minute; and before every 15th minute a male voice speaks the station identification. I'm told these voices are (or were) provided by Radio Shack Talking Clocks! On VNG frequencies 8.638 & 12.984 MHz, a slow Morse code signal before every 15th minute provides the station identification.

Maximum time error for VNG is 15 milliseconds.

In practice, I find the 5 MHz VNG signal is sometimes mixed in with WWVH (Hawaii), and occasionally WWV (US) or BPM (China?). These combine with VNG to produce a 'double beep' because of their propagation delay to Australia.

It also helps to carry a couple of metres of wire with a clip on it, to extend your radio's built-in antenna.

VNG has spent the last few years under constant threat of closure due to lack of funding. They will definitely operate for the rest of 2002, but after that is uncertain.

An alternative time source are the time beeps broadcast by ABC -Local- Radio on their various stations every hour on the hour. If necessary, right over the programming material being broadcast at that moment... The final beep in the series marks the start of the hour itself. These signals are tied into the national time standard, and the ABC are legally required to keep them accurate to within 0.1 second. Some station frequencies of interest:

Adelaide (5AN) AM 891 kHz

Andamooka (5ABCRR) FM 105.9 MHz

Leigh Creek (5LC) AM 1602 kHz (covers Lyndhurst too)

Marree (5ABCRR) FM 105.7 MHz

Roxby Downs (5ABCRR) FM 102.7 MHz

Streaky Bay (5SY) AM 693 kHz (covers Ceduna too)



## SETalk

Woomera (5WM) AM 1584 kHz (covers the Prohibited Area and adjacent highways).

Because of the legal requirement for accuracy, the various ABC Radio -National- stations do not broadcast time signals. This is because Radio National is sometimes relayed through satellite links which introduce a difficult-to-predict signal delay.

If you have Internet access then you could also use an NTP client to grab the time from the National Standards Laboratory (130.155.98.1) or from the University of Adelaide (203.21.37.18). cheers, Fraser Farrell

From: Dale Ireland

Hello The VNG time signal service was scheduled to cease operation June 30 but has been extended to Dec 31 02 but only on the condition that if any of the transmitters fail they will NOT be repaired. So the status at eclipse time is unpredictable. Dale

From: Joseph Cali

Different models of GPS display different times. My understanding is that the GPS time reference is very accurate. As a GPS user, you don't have access to that time signal though you can buy timing engines that can receive this signal in real time. What you see displayed as time on your GPS is usually the beginning of the integration period and lags behind UT by varying amounts depending on where you are located around the world. Joe Cali

### Cool pics

From: Egan Mark To: SOLARECLIPSES@AULA.COM Date: Thu, 31 Oct 2002 08:19:13

Hey Folks I hope all is well.... I've been a bit quiet the past few months.... more of a background observer.

Came across some cool eclipse pics the other day....

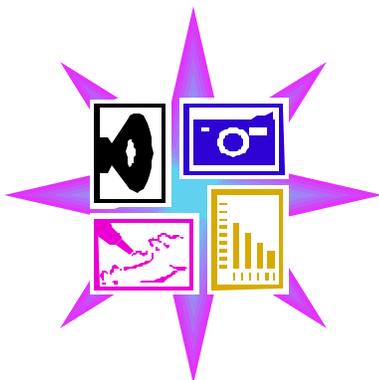
see them at: [http://www7.plala.or.jp/kaz\\_t/eclipse.html](http://www7.plala.or.jp/kaz_t/eclipse.html)

In fact, the 2nd one was taken at the June 10 (11) annular eclipse....

it's the only shot that I've been able to see from that eclipse that shows that much chromosphere (real cool prominence at 11:00 position)... all the other shots that I've found seem to have been filtered and only show photosphere, or were taken in Mexico w/ the clouds...

anyway I wish you all well for Africa and Australia....

small chance for me to go.... not much.... gotta sweet talk my boss into letting me off during our busiest time of year. Later, folks! Mark Egan [astrophoto@yahoo.com](mailto:astrophoto@yahoo.com)



## SETalk

**Deal of the Century: Atomic watch for \$50 US**

From: Bob Morris To: SOLARECLIPSES@AULA.COM Date: Fri, 25 Oct 2002 19:19:45

I happened into Costco, Ottawa, Canada about 1 hour ago and noticed the Casio "Wave Ceptor" watch, with stainless steel band, and very sleek and handsome stainless steel case, for \$80 CDN.

That's about \$50 US.

Was it what I thought it was? I bought one and took it home.

Sure enough, it synchronizes to Ft. Collins Colorado if the watch is within 2000 miles. No problem anywhere in US or (almost) Canada!

It shows numeric month/date on top, big numeric time (12 or 24 mode) to the nearest second, and day of week in three letter mode on bottom.

In autocalibrate mode, it syncs up at 2, 4, and 6 am each day.

Another display can show time in one other major city of the world, which can be changed.

It has an alarm, and stop watch, which I consider a necessity for parking.

When I got the watch home I checked it against the Canadian weather channel, which I've known is calibrated to WWV. Right on.

It also has year, so that it adjusts for leap year.

And auto DST/regular -- which I will see happen on Sunday.

And a backlight!

Too bad it doesn't have the moon phase and sunrise, sunset of the Casio Forester.

Oh, well, I'll wear one on each arm! :- ) Bob Morris



From: Peter Tiedt

The Forester must be the ideal umbraphile timepiece - I love mine! about \$65 is South Africa though :- ( P

From: Mike Simmons

I bought a wall clock that syncs to the radio time signal at Costco a couple months ago for \$20 US. Prices on these clocks and watches have really dropped over the last year or so. Mike Simmons

From: Glenn Schneider

Do they have a Canadian version to synchronise with CHU at 7.335 MHz?

Might have better reception in your Eastern provinces? -GS-

From: Dave Balch, The Stay-at-Home CEO

I tried to look up the Casio Forester, but there are several different models... which is the one you recommend?

## SETalk

From: Gerard M Foley

These gadgets use long wave signals. The U.S. signal from WWVB in Boulder CO is on 60 kHz. There is a German station on seventy some kHz which can be used in Europe, but needs a watch-receiver for that frequency. A "world" "atomic" (they are atomic only in the sense that the clocks used to control the radio signals use energy transitions in atoms) wrist watch has been advertised which is said to use either WWVB or a Japanese station. I doubt if the Japanese signal will cover all of the world that WWVB does not.

Short wave signals are reflected from parts of the ionosphere, and often from the earth (giving multiple hops). The variability of the transmission path means that the delay from the originating station (WWV or CHU and so on) varies from time to time. The long wave signals travel more in a wave guide fashion, trapped between the lowest regions of the ionosphere and the earth's surface. The travel time varies less than that of the short wave signals, and the strength of the LW signals varies much more slowly as a function of time than the short wave signals.

One can assume a fairly constant delay (transit time) for the LW signals, equal to the great circle distance from the transmitter divided by the velocity of light, and have better accuracy than making the same adjustment to the arrival time of the short wave signals.

There are many programs, most of them free, for setting the clock in a PC with reference to NIST, USNO and other time sources on the Internet. Most of these can interrogate the time source (ping) so as to estimate the transmission time over the Internet and correct the PC clock accordingly. I am not sure how much variation one can expect in the delay during the interval between pinging until the clock is set. Gerry K8EF IEEE

From: Harvey Wasserman

I got rather curious about these and found this one that includes the moon's cycle. <http://www.partshelf.com/lacrostecwsr.html> Harvey

From: Peter Tiedt

The Forester Model I use (and I think the only one that has these functions) is the "Fish 'n Time".

Peter Tiedt

From: Jay Friedland

Re: [SE] Ideal Umbraphile timepiece There's a great review of this watch at: <http://www.bythom.com/casio.htm> - Jay



### Digest

From: KCStarguy@aol.com To: SOLARECLIPSES@AULA.COM Date: Sat, 26 Oct 2002 19:50:08

Is it possible to get digest version of solareclipse? if not why not? Dr.Eric Flescher (kcstarguy@aol.com)

From: solareclipsewebpages@btopenworld.com

The question of having a SEML digest has been raised before. The only digest we offer is the monthly Solar Eclipse Newsletter (SENL), which can be downloaded and read free of charge. Besides all the SEML messages it has also other solar eclipse related messages and contributions. We have the SENL since November 1996.

See our Solar Eclipse Webpages. Please discuss further off line if you like. best regards, Patrick



## SETalk

### Eclipse logo

From: Evan Zucker To: SOLARECLIPSES@AULA.COM Date: Wed, 23 Oct 2002 18:09:19

As some of you may know, I own a company called Totality Software, Inc. I selected the name "Totality" because I'm a life-long umbraphile. (I would have said eclipse chaser, but I don't want to annoy Jay Pasachoff <g>.)

Unfortunately, I don't sell any software related to eclipses. The first programs I wrote and sold were astronomy programs, but I quickly learned that there's not a lot of money to be made in the astronomy software market. The program I sell, Abacus Totality, is a database program for managing collection accounts and is mainly used by small law firms and collection agencies. It may not be glamorous, but it does generate some revenue.

Since the company and program are named Totality, it made sense to use a logo that had some connection to eclipses (although I'm sure that many of my customers don't make the connection).

The only reason I'm mentioning all this is that I recently revamped my web site, and the new site makes more prominent use of the eclipse logo. If you'd like to take a look, you can find it at <http://www.TotalitySoftware.com>.

Note to Patrick: this is not a commercial solicitation or marketing ploy. I do not expect any of the members of the SEML to be interested in buying collection software. I just thought they might like to see the logo. Evan H. Zucker San Diego, California

From: Marc Weihrauch

Hello, Perhaps I missed something, but why would Jay Pasachoff be annoyed about someone calling himself an "eclipse chaser"?

And as we are talking about correct terms: How "official" is the term "umbraphile", actually? Best regards Marc

From: Jay.M.Pasachoff@williams.edu

To answer Marc's question: Eclipses go too fast to chase after. I claim I get there first and then the eclipse catches up to me. I think many people are misled by the term "eclipse chaser" to think that we are moving with or catching up to the shadow. Evan and I have discussed this point in the past. Jay Pasachoff

From: Evan Zucker

>Perhaps I missed something, but why would Jay Pasachoff be annoyed about someone calling himself an "eclipse chaser"?

I see Jay has answered this already.

>And as we are talking about correct terms: How "official" is the term >"umbraphile", actually?

I don't think it's "official" at all, but I couldn't think of a better term than eclipse chaser. I know of it mainly in connection with Glenn Schneider's software, although I found several other references to it on the Web. <http://www.google.com/search?hl=en&ie=UTF-8&oe=UTF-8&q=umbraphile> -- EVAN

From: Glenn Schneider

Evan Zucker wrote: ...but I quickly learned that there's not a lot of money to be made in the astronomy software market.

Is there any???? ;-)

## SETalk

BTW - Any members of SEML can freely download and use any of the astro related S/W on my <http://balder.prohosting.com/~stouch/> site - not just umbraphile (just let me know if you are using it, don't bother with any "shareware fees"). So as Evan said:

> Note to Patrick: this is not a commercial solicitation or marketing ploy.

-GS- P.S. Cool logo.



From: Glenn Schneider

I really WOULD like to be corrected on this, but I actually hadn't seen anyone use the term before I first started using it - actually a variant after I saw my first TSE in 1970. I had written to a NYC astronomy club newsletter (the Amateur Observer's Society, of which Evan Zucker of SEML was also a member, but not sure if at that time) 32 years ago of how I "reveled in umbraphillic delight" at that event. Shortly thereafter I started using the term fairly regularly in the form "umbraphile". I do not want to "claim credit" for coining a usage which might have pre-dated me and for which I may have picked up upon subconsciously. So if anyone knows of a prior use or origin (at least in the context we use it) PLEASE let me know.

Now... I "formally" used the name Umbraphile for my automated eclipse S/W in that it was copyrighted in 1994 - the S/W that is. Though, of course there have been many updates and releases since then, and I have no idea about the "legality" of such re-issues without updating a copyright which I never did (Evan, you are a lawyer, any thoughts)? Actually, I am not litigious by nature, so I don't really care about that. But I would be moderately upset if someone usurped the name!

Though probably all here are tired with this link:

<http://nicmosis.as.arizona.edu:8000/UMBRAPHILLIA.html>

FYI, though, UMBRAPHILE is not in the Oxford English Dictionary. So, I would cast any doubt on its "officialness" (neither is officialness, so sorry about that). Maybe it is time to lobby them on this omission? UMBRAPHILE, that is, \*not\* "officialness" ;-). Ah, I can see Jay cringing as he reads this... Cheers, Glenn Schneider

From: Klipsi

yeah, we should call it "eclipse interceptor " or, if you could manage to catch up the umbra at high speed (Mach 10 supersonic flight), "eclipse velociraptor "

sounds cool... "YO, WHAT YA DOIN' ?" -"I'm an eclipse velociraptor." ;-). Klipsi

From: Peter Tiedt

Perhaps Fred's experiences at the 1980 TSE in Kenya (published in "Totality") could be described as "eclipse chasing".

I am sure those experiences are not unique.

But, seeing as (from an earth bound viewpoint) a solar eclipse (total) is really an occultation, and a solar eclipse (annular) is really a transit, and only a lunar eclipse (total) is an eclipse, don't we need a term that does not use the word "eclipse"?.

Umbraphile fits the description, so does coronaphile and I am sure there are others ...

Peter Tiedt [rigel@stars.co.za](mailto:rigel@stars.co.za) Visit my website at <http://www.eclipse.za.net>

From: Vic & Jen Winter - ICSTARS Astronomy

## SETalk

How closely does eclipse "chasing" even imply "catching" anyway?

I would rather be classified as an eclipse catcher than an eclipse chaser myself. Otherwise, there is some kind of insinuation that the eclipse eludes the chaser.

Although, I'm not exactly sure how one bags an eclipse anyway? ;-)

I'm configuring a web-based Totality 2002 countdown clock on the [www.icstars.com](http://www.icstars.com) site and having a little trouble. It's not clear in programming, if the time/date stamp is taken from the processor of the machine the website is located on, or the remote machine the website is viewed. I'm going to have to run some tests to ascertain what time standard is in play so not to be a source of inaccurate information. It will take quite some time doing cross-calculations to determine accurate time.

Truthfully, I will have to post different countdown timers for different viewing locations to be fair. We have two observing sites in Africa and Australia, so I plan to program two counters. If others in the group are interested, I can attempt to program a page with different timers for each viewing location. (only after I have determined the timing can be somewhat accurate.) Let me know if this is something others would care to have customized. Clear Skies, jen

From: Gordon

One definition of the word "eclipse", from American Heritage Dictionary;

e-clipse (i-klips') n. 1) The partial or complete obscuring, relative to a designated observer, of one celestial body by another. 2) Any temporary or permanent dimming or cutting off of light.

I really like this description (#1), so I use it on my website, although I am sure there are some other well written variations. The term eclipse, as defined in the English language, is actually quite descriptive and accurate. Gordon [www.eclipsetimer.com](http://www.eclipsetimer.com)

From: Jay.M.Pasachoff@williams.edu

That's easy: haven't you seen those cans of "eclipse darkness," made by opening and then closing and sealing a can during totality?

A countdown timer would be fun. Jay

From: Peter Tiedt

what does the AHD say about occultation and transit?

From: Glenn Schneider

I typically defer to the Oxford English Dictionary.

I suppose here we are talking about the use of the word ECLIPSE as a noun, rather than as a verb. Here is what OED says, and I will confess I never looked before and I had never known the use of the word as in definition #3!

=====

1. a. Astron. An interception or obscuration of the light of the sun, moon, or other luminous body, by the intervention of some other body, either between it and the eye, or between the luminous body and that illuminated by it; as of the moon, by passing through the earth's shadow; of the sun, by the moon coming between it and the observer; or of a satellite, by entering the shadow of its primary. Also in phrase, in eclipse. For annular, partial, total eclipse, see those adjs. Cf. OCCULTATION.



## SETalk

a1300 Cursor M. 16814 Oft siths haue we sene..esclepis [v.r. clipes, clyppes, clippis] of sun and mone. c1374 CHAUCER Boeth. (1868) 133 Whan e moone is in the eclips. 1393 LANGL. P. Pl. C. XXI. 140 is eclipse . at ouer-close now e sonne. 1494 FABYAN VII. ccxlvii. 289 In ye yere of our Lord .xii.c.xxii...apered a great eclypce of the sone. 1549 Compl. Scot. vi. (1872) 55 In the tyme of the eclipsis, the eird is betuix the mune and the soune. 1605 SHAKES. Lear I. ii. 112 These late Eclipses in the Sun and Moone portend no good to vs. 1637 MILTON Lycidas 100 That fatal..bark Built in the eclipse. 1750 HARRIS Hermes (1841) 119 Often had mankind seen the sun in eclipse. 1868 LOCKYER Heavens 258 An eclipse of Titan. 1871 PALGRAVE Lyr. Poems 33 The Sun cloak'd himself in wan eclipse.

b. transf. Absence, cessation, or deprivation of light, temporary or permanent; techn. the periodical obscuration of the light from a light-house.

1526 Pilgr. Perf. (W. de W. 1531) 305 A vniuersall derknes & eclipse was ouer all the worlde. 1563 Mirr. Mag., Buckhm. xciii, With fowle eclypse had reft my syght away. 1671 MILTON Samson 80 Blind among enemies.. Irrecoverably dark, total eclipse. 1784 COWPER Task III. 736 The eclipse That metropolitan volcanoes make. 1830 TENNYSON Burial of Love, His eyes in eclipse. 1858 Merc. Mar. Mag. V. 186 A Fixed Red Light, varied by flashes preceded and followed by short eclipses.

2. fig. a. Obscuration, obscurity; dimness; loss of brilliance or splendour.

1598 R. BARCKLEY Felic. Man (1631) 645 This..eclipse of Christian manners, doth presage the destruction of the world to be at hand. 1642 FULLER Holy & Prof. St. II. xxi. 140 God oftentimes leaves the brightest men in an eclipse. 1650 Bounds Publ. Obed. (ed. 2) 18 How knowes he..that the..Power is..in an Ecclipse? a1711 KEN Serm. Wks. (1838) 114 Goodness has an inseparable splendour, which can never suffer a total eclipse. 1878 BROWNING La Saisiaz 31 When I..declare the soul's eclipse Not the soul's extinction.

b. (See quot. 1838.) Hence eclipse-dress, -feathers, -plumage.

1838 C. WATERTON Ess. Nat. Hist. 202 At the close of the breeding season, the drake undergoes a very remarkable change of plumage..and ..is..so completely clothed in the raiment of the female, that it requires a keen..eye to distinguish the one from the other... Thus we may say that once every year..the drake goes, as it were, into an eclipse. 1906 C. W. BEEBE Bird 48 The invisible cloak of his brooding mate is dropped over him for a whilehis colours vanish, and by a partial moult..the hues of his plumage change to an inconspicuous mottling of brown, hardly distinguishable from the female... This has been happily termed the 'eclipse' plumage. 1913 Brit. Birds VII. 2 The short eclipse-feathers..differ so little in general tint from the feathers of the winter- and breeding-plumage..that it is difficult to see what advantage the bird derives from the change. Ibid. 74 The second eclipse is for the most part similar in colouring to the first eclipse,..but these second eclipse Eiders can always be distinguished..from the first eclipse..birds. 1914 Bull. Brit. Ornith. Club XXXIII. 67 The pigment for the coloration of the eclipse-dress was beginning to form. 1930 KIRKMAN & JOURDAIN Brit. Birds 159 Gadwall..In eclipse much like duck. 1958 BANNERMAN Birds Brit. Isles VII. 1 The male [sc. mallard] in eclipse resembles the female closely. Ibid. 31 The adult drake [of the teal] begins to assume eclipse plumage in June.. by August the eclipse is complete.

3. A fraudulent device in dice-playing; (see quot.). Obs.

1711 J. PUCKLE Club (1817) 19 Gamesters have the Top, the Peep, Eclipse [note, securing with the little Finger, a Die on the outside of the Box], Thumbing, etc. -GS-

From: eclipse98

Is this why they call it "fishing" instead of "catching"? I hope everyone who attempts to see this year's TSE is successful! Once again Hole in the Sky will be hosting a "Photo and Writing Contest". You can find the results of the last two contests on the web page: [www.holeinthesky.com](http://www.holeinthesky.com) I will post details for this year's contest soon. Anyone who views the eclipse is eligible to enter, and I will post the entries on the web page. It has been a great way to 'document' the eclipse, especially for people who have never seen one before! Jerry

## SETalk

From: Joel Moskowitz

Jay, Glenn Schneider's Umbraphile program has a countdown timer as part of the camera controller. Even gives you a "remove filter" warning 15 sec before totality. (with sound).

From: Mike Simmons

The freeware World Time 5 has a multiple countdown clock in addition to more time functions and utilities with maps, time zones, displays, sounds, and various doodads that can be customized than I want to try to describe. It's at <http://pawprint.net/wt/>. I'd guess at least half the people on this list would find something useful in it. Mike Simmons

### Eclipse Catcher - counting down

From: Joseph Cali

Patrick, This message for your approval for SEML. It has commercial content but relates to Vic & Jen's message about eclipse timer. regards Joe Cali

Vic & Jen, If the timer is for your own use, you might prefer a non-virtual type of counter.

Jaycar electronics <http://www1.jaycar.com.au>

sells a project timer for A\$10 (divide the price by 2 to get USD) that counts down time to the end of a project up to 2999 days.

The online link is this long link or you can search on timer on their page

`http://www1.jaycar.com.au/productView.asp?ID=XC0125&CATID=&keywords=timer&SPECIAL=&form=KEYWORD&ProdCodeOnly=&Keyword1=xxxxxxxxxx&Keyword2=xxxxxxxxxx&pageNumber=&priceMin=&priceMax=&SUBCATID=`

AUD\$ displayed. STOCK-CODE: XC0125 - Limited

RRP: \$9.95 Qty 1+ \$9.95

Qty 3+ \$8.75

Qty 6+ \$7.75

LCD Project Countdown Timer

This handy little timer can be set to count down the days (or hours!) you have to finish that big project: It doubles as a clock calendar as well. Simply load in the current date & deadline date & it will count down for you.

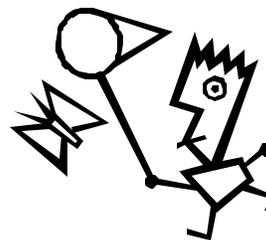
- Will go out to 2999 days.

- Includes slide window for project description and tilting bail.

- 130W x 63Hmm.

- Battery extra (1 x AAA).

Joe Cali( message submitted to list owner for approval first)



## SETalk

### Free Eclipse calculation software

From: heinzscs@pop3.ccc.at To: SOLARECLIPSES@AULA.COM Date: Wed, 23 Oct 2002 21:17:29

Hello, a free eclipse calculation software can be downloaded from: <http://www.lcm.tuwien.ac.at/scs/welcome.htm>

This software has been used to create the images at the Africlipse website ([www.eclipse.za.net](http://www.eclipse.za.net)).

If you enjoy using the program, please let me know. H. Scsibrany

From: Francisco A. Rodríguez Ramírez

It's Wonderful Heinz !! Congratulations ! Atte. Francisco A. Rodríguez [www.saros.org](http://www.saros.org) [www.astroeduca.com](http://www.astroeduca.com)

From: Jean-Paul GODARD

I recommend to everyone the use of this software.... One of the greatest features is the ability to draw together eclipse paths from different dates...

Very usefull to draw "your own paths" on a map. Cordialement, [jean-paul.godard@noos.fr](mailto:jean-paul.godard@noos.fr)

### GPS devices

From: analog6@ozemail.com.au To: SOLARECLIPSES@AULA.COM SOLARECLIPSES@AULA.COM Date: Sat, 26 Oct 2002 01:16:12

Can those of you who have used teh tell me what teh best GPS units are (I realise I'm getting personal opinions, but hopefully they will be weighted towards one unit or brand). I'm considering buying one for the eclipse, but they are very expensive here and I want to be sure I get a good one. I can't afford top of the range, but have long wanted one for teh accuracy in telling you where you are. Please reply to my direct email, not via Solar Eclipses! Odille Esmonde-Morgan Canberra, Australia

[analog6@ozemail.com.au](mailto:analog6@ozemail.com.au) <http://analog6.members.easyspace.com>

This message was sent through MyMail <http://www.mymail.com.au>

From: Joseph Cali

Any consumer GPS unit will be accurate enough to find the centreline of a solar eclipse. You only need to be within a few KM of the centre line. I think most GPS units are much more accurate than this. Even the old scrambled GPS units during the gulf war era were accurate within 100-200m. Modern units are much better. Joe Cali



### Happy birthday !

From: Klipsi To: SOLARECLIPSES@AULA.COM ate: Thu, 24 Oct 2002 12:09:47

Happy birthday to the October 24 1995 total eclipse ! 7 years ago already !

This was my 2nd total eclipse. Saw it from Thailand. What a great event it was ! see <http://eclipse.span.ch/october.htm>

diamondring videos

<http://eclipse.span.ch/video3.htm>

<http://eclipse.span.ch/video4.htm>



## SETalk

(best seen with MS I.E. )

realplayer for 56k dialup connection, with sound <http://eclipse.span.ch/eclipsethailand95.rm>

Since that eclipse, I have been to 4 more total solar eclipses (97,98,99,01), 4 more annular (98,99,01,02), 4 more partials (96, 96, 97, 00). Plus to many other sky events round the planet: tornados, graze occultation, double occultation, leonids, etc. Geeezzzz, no wonder I'm always broke - those trips swallow all my precious swiss francs ! ... Well, you only live twice, so what the heck... go travel that planet ! Go chase the umbra, just go ! .... eclipsevelociraptor ! hehehe...

anyway, I love to think back to the October 24 1995 eclipse. The following TSE , 97 Mongolia, was when I first met Fred, Ken, Jay. :-) Klipsi

### New Moon November 2002

From: Rybrks1@cs.com To: SOLARECLIPSES@AULA.COM Date: Sun, 27 Oct 2002 21:46:37

New Moon is Novemer 4, 2002 at 20:35 UT

Only one MOON-th to go to the next eclipse.

All of the five new moons between the June Puerto Va llarta eclipse and the December Africa/Australia eclipse are high passes over the sun. The first two passes of these five, July & Aug, were associated with the ascending node and will come to Earth in the future as eclipses and the last two of the five, Oct & November, associated with the descending node were already here as eclipses in the past. The middle new moon of the five, September high pass, nearly exactly split the nodes but slightly favored being closer to the descending node so it too is like Oct and Nov and was already here.

The new moon coming a week from Monday is part of Saros 104 which visited Earth as all annulars, last annular being Sept 1317AD. The partials ended May 13, 1714 AD in Siberia and all the new moons have been high passes ever since. Maintaining the 18 yr 11 day step it will evolve into Saros 327 ( $104 + 223 = 327$ , 223 new moons in a saros increment) and return to Earth from the north associated with the other node. The new series will be a dozen totals, 3 hybrids very close to gamma of zero and then 25 annulars.

The shadow at the Earth's Vertical Centerline is 66.3 miles in diameter and would allow someone to witness a 1 minute 44 second total solar eclipse if positioned over one Earth radius above the Earth's limb as the shadow rushed by at 2,299 mph. The shadow cone extends 3,070 miles (less than one Earth radius) beyond the night limb of Earth.

Perigee is 20 hours earlier than this new moon and the new moon is about 400 miles farther than at perigee. Raymond Brooks

### Solar Eclipse Charts

From: Francis Graham To: SOLARECLIPSES@AULA.COM Date: Fri, 25 Oct 2002 21:15:03

Dear List: I continue to be impressed with Fred Espenak's solar eclipse charts to AD 3000. In a previous communication, I suggested the refinement of putting cities on the maps instead of national borders, which are not very enduring over the span of the maps. Or even a century. Although theyhelp to orient the user better than blank continental landforms, cities would be better as cities do endure millenia. Well, some.

Now another idea. I suppose the principal problem in extending the maps to AD 20,000 and back to 10,000 BC (besides the tenfold human work time) is the uncertainty of delta T estimates. In that case, the tracks could be rendered in statistical contours that would show the uncertainties (in units of kilometers of one half standard deviations) . One tends to give a fair guess as to the error anyway with the current maps. This extension of the eclipse atlas in this fashion would be faithful to the truth, while at the same time offering much to the eclipse analyst. I also think one might see many interest-

## SETalk

ing anomalies of the kind Jean Meeus and Mr Nowak were discussing, which occur only outside of the present close historical period. Also, the statistical extension back to -9,999 would encompass all historical time and time in which there is the majority of archaeological artifacts. Fred, I can only say, your atlas is so good, it is tempting to want MORE. Forgive me. Francis Graham

### The Ring - Movie

From: Glenn Schneider To: SOLARECLIPSES@AULA.COM morris@sce.carleton.ca Date: Sat, 26 Oct 2002

Bob Morris has called to my attention the new movie "The Ring" from DreamWork pictures, and noted to me off-line from SEML:

"the TV previews show what looks like an annular-total eclipse as "the ring."

You can see that on the studio's web site at: <http://www.dreamworks.com/thering/>

which looks a lot more like a "broken annular" - like the 1984 eclipse up the east coast of the USA (not the total off New Caledonia) than the chromospheric ring (diamond tiara) eclipse I saw in 1984 and was somewhat similar (or so I believe) to the 1966 Bob has reported on. I don't have any images from that 1984 eclipse scanned to my web site (will have to find time to do that), but The Ring movie promo bears a strong resemblance - morphologically but with artistic license - to the image Wendy Carlos has on her web site:

<http://www.wendycarlos.com/eclipse/84-anlr+cor.jpg>

(I'll take her exquisite photo over that, of course, any day).

I can assure you that the corona (which WAS visible to the eye - particularly when you stuck a thumb up at arms length as an occulting disk) was NOT throbbing as Dreamworks pictures it. Glenn Schneider

P.S. Public thanks to Jen & Vic for the idea of the "trailing cursor" which I now have implemented on: <http://nicmosis.as.arizona.edu:8000/UMBGRAPHILLIA.html>

(Ah, the things we do when we need distractions...)

From: Mike Simmons

Griffith Observer, a publication of Griffith Observatory in Los Angeles, features an image from advertising for The Ring on the cover of the current November issue. An explanation of the cover inside the magazine (written by observatory director and well-known umbraphile E.C. Krupp) begins, "What could pass as a respectable annular eclipse advertises a soon-to-be-released feature film, The Ring, in the vicinity of Sunset Boulevard and Holloway. This image may, on the other hand, document the inner corona during totality. Or perhaps something else is going on."

The issue features an article by Joel Harris of Twilight Tours on the anxiety and uncertainties of eclipse travel, "Good to the Last Drop" and photos of Griffith Observatory and its 1200 visitors during the partial eclipse of 10 June 2002. The back cover features a frame grab from an amateur video showing the distinguished observatory director and archaeoastronomy expert leading a band of noisemakers equipped with pots and pans at the height of the eclipse in what was reportedly a successful attempt to scare off the evil creature that was devouring the Sun.

The center photograph features two observers outfitted with full-face welding masks equipped with #14 welding glass. For those interested in this method but who are too fashion-conscious for the usual utilitarian look I suggest <http://hoodlum-welding.com/hoods.htm>. If you act quickly it will double for use on Halloween.

Griffith Observer can be ordered at <http://www.griffithobs.org/Observer.html>; \$2 for back issues in the current year, \$18 (or more depending on shipping options) for a one-year subscription. Mike Simmons

## SETalk

**Zambian Eclipse related article**

From: Mike Murphy To: SOLARECLIPSES@AULA.COM  
Date: Tue, 29 Oct 2002 13:38:58

Hi all, some of you might be interested in this article in The Post today (29.10.02):

Eclipse of the sun to be marketed at WTO: <http://www.zamnet.zm/zamnet/post/homenews2.html#HOMECE> (and scroll down a few screens).

Or the newspaper's front page is at: <http://www.zamnet.zm/zamnet/post/post.html>

Only a month to go and they are just thinking about marketing it! - Mike

From: Michael Gill

Well, that compares favourably with Iraq and the TSE of August 11th 1999!

According to the official Iraqi government report of the '36th Cabinet Session' they decided "to set up a ministerial committee chaired by Health Minister to issue the necessary instructions to state departments and people on the total eclipse of the sun, which will occur over Iraq, specifically over the city of Mosul and northern Iraq. The committee shall raise people's awareness to avoid the potential harm of invisible radiation concomitant with the phenomenon."

The session was held on August 10th 1999 - just one day before the TSE, so that didn't leave the ministerial committee with much time! <http://www.uruklink.net/iraq/e1999/cabaug.htm> Michael Gill



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2**Africlipse website now on a faster server**

From: Peter Tiedt To: Solar Eclipse Mailing List <SOLARECLIPSES@AULA.COM> Date: Wed, 16 Oct 2002 21:04:48

I have now moved the Africlipse website to a (hopefully) faster server, and also with far less copper between the ISP and the main external SA pipe.

This should solve reported problems about the speed of download of the site.

Reports on load time would be appreciated.

Main Page: [www.eclipse.za.net](http://www.eclipse.za.net)  
 2002 TSE [www.eclipse.za.net/html/2002.html](http://www.eclipse.za.net/html/2002.html)  
 Detailed Predictions [www.eclipse.za.net/html/2002\\_pred.html](http://www.eclipse.za.net/html/2002_pred.html)  
 Tours [www.eclipse.za.net/html/2002\\_tours.html](http://www.eclipse.za.net/html/2002_tours.html)  
 Accommodation [www.eclipse.za.net/html/2002\\_w2s.html](http://www.eclipse.za.net/html/2002_w2s.html)

Peter Tiedt [rigel@stars.co.za](mailto:rigel@stars.co.za) Visit my website at <http://www.eclipse.za.net>

From: Stig Linander

A couple of South African web-sites with eclipse information. I don't remember seeing them mentioned on the SEML before. Sorry if they have.

Johannesburg Planetarium: <http://www.wits.ac.za/planetarium/>

EclipseLine: <http://www.eclipseline.co.za/>

Hartebeesthoek Radio Astronomy Observatory: <http://www.hartrao.ac.za/>

Best regards, Stig. - Stig Linander -- The Ophiuchan -- [www.linander.dk/stig](http://www.linander.dk/stig) - This email is optimized for Pine in an 80x24 Xterm -

**Australia Eclipse Tour**

From: "Continental Capers American Express Travel" <[eclipse@flycapers.com](mailto:eclipse@flycapers.com)> To: <[eclipse@hydra.carleton.ca](mailto:eclipse@hydra.carleton.ca)> Date: Wed, 2 Oct 2002 Subject: [eclipse] Australia Eclipse Tour

Continental Capers Travel Center, an American Express agency, has organized a spectacular 19-day solar eclipse tour to Australia. This tour has been sold out for several months but last week two people canceled.

Therefore, we have an opening for one or two people who would like to experience not only a total solar eclipse in the Australian outback but also many of the natural wonders of Australia.

Our group is limited to 30 participants. We specialize in small groups and have led other successful eclipse trips.

This trip visits the Great Barrier Reef, stays at the Observatory hotel in Sydney, visits Siding Springs Observatory, Henbury Meteorite Crater Reserve, Ayers Rock, Kangaroo Island, the Barossa Valley wine country and more. On the night before the eclipse we stay in Blinman, two hours from the center line. On eclipse day we have secured a private site near Lyndhurst only 2.4 km north of the center line.

A Continental Capers Travel Consultant, local professional guides and a professional astronomer will accompany our tour.

For more information on this tour see our website at <http://www.flycapers.com>.

If you are interested in this tour, please contact me at 800-446-0705 or [marian@flycapers.com](mailto:marian@flycapers.com) in the next few days. Thank you, Marian Cohen Travel Consultant



**Position Wanted**

From: Robert B Slobins To: "INTERNET:SOLARECLIPSES@AULA.COM" <SOLARECLIPSES@AULA.COM>  
Date: Thu, 03 Oct 2002 04:25:42

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I know that it is a bit late, but I have decided to try anyway:

I would like to offer my services as an eclipse photography expert and advisor to a group or party in either Africa or Australia on 4th December 2002.

Briefly, I can offer:

Luck--I have seen all 11 total and 3 annular solar eclipses that I have attempted.

Experience--I have used all types of cameras, from the simple hand-held one in 1970 to the professional 35mm equipment I travel with now. Also, I have made enough of the mistakes; I am familiar with them so that I may advise the less-experienced accordingly.

From my work in information systems development to flying a plane, I have learned the value of organising one's efforts. I can communicate basic project management techniques at a fundamental level.

I have studied eclipses and solar physics for many years and know enough to enable others to obtain the best results with what they have and what the weather has to offer except heavy clouds. (I do not worry about cirrus.) I know how to do wonderful things with diffraction gratings.

Results--I have had my images published worldwide, especially in major astronomical magazines. Additionally, I have had my astronomical imaging accepted into regional and national (US) juried art shows. I can provide a listing on request. One can see samples of my work on [www.spacew.com/gallery.html](http://www.spacew.com/gallery.html) (go to topic index and click on eclipses).

I am represented by a stock agency, Phototake.

My wife Elisabeth has a degree in tourism from a Rio de Janeiro university and several years' experience escorting tourists around the city. She has three expeditions already and has can keep things together and everyone, natives and tourists, happy. Should one wish to contact me, here are my e-mails:

1--rslobins@yahoo.com (preferred)  
2--76630.2206@compuserve.com

Thank you for your consideration Robert B Slobins

**GPS alignment alternatives**

From: GMadden To: Solar Eclipses <SOLARECLIPSES@AULA.COM> Date: Mon, 21 Oct 2002 19:59:02

Anyone know of or used a precision motor driven platform for RA and DEC tracking using the Global Positioning System? mad-

**Australian Eclipse related article**

From: Jean-Paul GODARD To: SOLARECLIPSES@AULA.COM Date: Tue, 29 Oct 2002 22:04:41

2 pages dedicated to eclipse in the october edition of the magazine "The Australian way" from Qantas . Free on board ;-))

In the same edition, an other article: " antarctic adventure: the final frontier in luxury cruising" (in advance for 2003) Cordialement, [jean-paul.godard@noos.fr](mailto:jean-paul.godard@noos.fr)

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2**Request help for partial eclipse experiences**

From: Claire Flanagan To: SOLARECLIPSES@AULA.COM Date: Thu, 17 Oct 2002 06:32:23

This is a deeply embarrassing question to address to this list, but I've not come across a clear answer anywhere else (aside from: if you can walk or crawl or otherwise get into the path of totality, then do it, which I believe): can anyone tell me how noticeable almost-total partial eclipses are?

I need to know because we at the Johannesburg Planetarium are going to be asked what will be seen from near (but not within) the path of totality, and I can't answer them, not being an experienced eclipse observer myself.

I have heard from someone who saw an annular eclipse in Canada that no-one else noticed it (if that was the 1994 eclipse, then it was around magnitude 94%). I'd really appreciate anyone who has experienced an eclipse of magnitude 90% + could let me know what if any environmental changes were noticed. It might be better if responses were sent to me directly (111flan@cosmos.wits.ac.za) instead of to the list ... Thanks in advance Claire Flanagan Johannesburg Planetarium South Africa

From: Joseph Cali

I saw the 94% annular near the Canadian border and the change in light level was very easy to notice. The annular of Jn 15 1991 was about 80% in Canberra. Light drop was very obvious. I'd say that about 80% is the point where the change in the intensity of sunlight might make some people (those who are generally more aware and observant of their surroundings) wonder what's going on. Jo'burg's 86% will probably be noticed by a fair proportion of the population, by some. It's a pity the eclipse isn't at sunrise. Whenever I've been in Joburg, I've enjoyed looking at the dark red orb setting in the evenings through the smoke haze. Joe Cali <http://joecali.members.easyspace.com>

**Local Australian observer**

From: Evan Zucker To: SOLARECLIPSES@AULA.COM Cc: simonharder@ozemail.com.au Date: Wed, 23 Oct 2002

A friend of mine is a native Australian living in Sydney. Like most "normal" people, he knows little about eclipses.

I've been telling him for some time that it would be well worth his while to make his way west to observe the total eclipse on December 4. Now that the local news media is starting to publicize the eclipse, he has decided that perhaps I was right.

He is wondering where the best place to go would be. He is thinking of Lyndhurst. I told him there are several tour groups heading for Australia and that he could contact one or more of them. I assume there are some members of the SEML who are heading there on their own. Perhaps some of them would like to get in touch with my friend as a source of local information, and they could join forces.

If any of your folks would like to get in touch with my friend, please let me know privately.

I wish I could go, but after vacations earlier this year to the Olympics, Hawaii, and Alaska, I think I've maxed out on my time away from work and child care. Evan H. Zucker San Diego, California

From: Fraser Farrell

There's a lot of information on the Ceduna tourism website: <http://www.ceduna.net>

Also on the new website from the SA Tourism Commission: <http://www.eclipse2002.com.au>

Or on my website...

> I wish I could go, but after vacations earlier this year to the Olympics, Hawaii, and Alaska, I think I've maxed out on my time away from work and child care.



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Take your kids with you. Mine are getting the whole week off school. Although I'm still not sure if their teachers were persuaded by the This Is A Rare Educational Opportunity argument, or the Our Dad Is Taking Us Anyway argument ;- ) cheers, Fraser Farrell

From: Mike Simmons

We took our kids out of school for two weeks for the last total solar eclipse in our country 23 years ago, USA. We had to drive over 1000 miles and we decided to make a sightseeing trip out of it while we were at it. We used your second argument above. ;- ) Mike Simmons

From: Assoc Prof J R Huddle

Some school administrators in the USA allow "Family Religious Function." as an excuse to miss school. I heard of one case in which the TSE was not considered an appropriate educational opportunity, but the photo-safari afterwards was. Go figure! Jim Huddle

### South Australia

From: Jean-Paul GODARD To: solarECLIPSES@AULA.COM  
Date: Thu, 31 Oct 2002 20:42:26

We are looking for joining an eclipse trip starting from Adelaide, Melbourne,...

Aware of any opportunity? Cordialement, Martine & Jean-Paul ("We met in Moon's Shadow") tlouzeau@noos.fr jean-paul.godard@noos.fr

From: Fraser Farrell

Jean-Paul, Wayward Bus Tours told me (last week) they still had a few seats left on their Lyndhurst & Ceduna trips. Tours start & end in Adelaide:

<http://www.waywardbus.com.au>

Incidentally, don't use the Bureau Des Longitudes eclipse map for Australia. It has numerous errors & omissions. cheers, Fraser Farrell



### Commemorative T-Shirts for the 2002 total solar eclipse

From: Gary Spears To: "SOLARECLIPSES@AULA.COM" <SOLARECLIPSES@AULA.COM> Date: Tue, 01 Oct

Hey everybody! Check out these commemorative T-Shirts for the 2002 total solar eclipse!

2002 African Eclipse T-Shirt: <http://www.MrEclipse.com/Store/Tshirt/Tshirt2002a.html>

2002 Australian Eclipse T-Shirt: <http://www.MrEclipse.com/Store/Tshirt/Tshirt2002b.html>

From: Dale Ireland

Is it OK for the rest of us to place commercial advertisements on the list too? I have some stuff to sell. So, what eclipse is that on the shirt? '94 Bolivia? Dale Ireland

From: solareclipsewebpages@bopenworld.com

Dear All, At least once a year we have to remind the list on the agreed rules of the SEML. By signing in to the SEML you confirm you can live and accept the SEML rules. Please note commercial messages are not allowed. It is rather hard and subjective when a message is commercial. In case the sender doubt, please send the message first to the list owner (address below). If you want to re-read the rules, please check the webpages below.

As mentioned many times, but a repeat for the new subscribers, this is a private solar eclipse related mailing list. Everybody is free to leave if you can not agree with the way we handle and monitor. The one who can not accept the rules might be put in the read only list and might be removed. Please understand (and appreciate) the independent character of this mailing list. If you have still questions, remarks or frustrations, please drop us a personal mail. Do not start discussions or attacks on this mailing list. Thank you. PS: All commercial messages will be placed in the Solar Eclipse Newsletter. Thank you for your understanding ... and ... keep those solar eclipse messages coming... Best regards, Patrick

**Vanessa Carlton video clip**

From: Fraser Farrell To: eclipses <SOLARECLIPSES@AULA.COM> Cc: ASSA-chat <assa-chat@assa.org.au> Date: Wed, 09 Oct 2002 10:36:52

To all, The following refers to a music video I haven't seen myself. But it is probably being broadcast in a lot of countries; so be prepared to encounter dimwits who think it's now Cool & Trendy To Watch The Sun Without Eye Protection....

Frankly, I'm hoping that someone sues Ms Carlton - and everyone associated with this video - into bankruptcy. For promoting gratuitously stupid and known-to-be-dangerous behaviour.

----- Forwarded Message -----

I would suggest if either of you can, try to take a look at a music video clip by Vanessa Carlton, called Ordinary Day. It depicts several hundred people, including Vanessa, watching a solar eclipse without any protection.

In fact it shows people doing the exact opposite of what you should do, i.e. looking at the sun during the partial phase and looking away during totality. There is one particular section where the eclipse has gone to the diamond ring phase and they are all staring at it.

I have seen it two weeks in a row on network 10's video hits. It is a new release and will probably be in the top 40 charts at the time of the eclipse.

[ nb - the 2002 Dec 4 eclipse ]

I have made a complaint to the Australian Broadcasting Authority, Network 10 and A&M Records. From their lack of response I doubt they will do anything about the problem. I have also reported it to Craig Steel at the DOHS (Dr. Angela McLean is away) and he sounded like he would help.

I don't have access to the SEML as yet, and would be interested to know what everyone on there thinks of the film clip.

Regards David Finlay Starfield Scientific & Photographic Services PO Box 232, Port Kembla, NSW, 2505 Fax: (02) 4227-4482 Web: <http://www.starfield.com.au>

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----- Forwarded Message Ends -----

cheers, Fraser Farrell

From: Gerard M Foley

Many commercials shown on American Television for automobiles portray the most suicidal kind of driving. The influence of these is far more likely to cause injury than one showing hazardous behavior during eclipse. At least in the case of the eclipse, there is always a great deal of counseling about the hazards in the days before eclipse.

Unhappily the warnings about damage to the eyes are sometimes misunderstood, so that people in the path of totality are afraid to look at the sky. In some places school children have been kept indoors during totality because of the erroneous fear of eye damage. Gerry <http://home.columbus.rr.com/gfoley> <http://www.fortunecity.com/victorian/pollock/263/egypt/egypt.html>

From: Dave Schmahl

If you go to <http://launch.yahoo.com/artist/videos.asp?artistID=1097970> you can watch the "Ordinary Day" video online.

From: Evan Zucker



(Continued on page 64)

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I'd be amazed to find ANY place in the United States where school children are not locked indoors during eclipses. In this country the fear of litigation is endemic (because litigation is endemic). -- EVAN

From: Kidinvs@aol.com

It seems that, after watching the video, they are not using any protection during the eclipse, either. Rick Brown www.eclipsesafaris.com

From: Robert B Slobins

In July 1963, I saw my first eclipse, total in Maine, but at my location, 94% partial. (It is not fun to be a child!) I remember the warnings about eye damage. We were also taught how to project a solar image on a surface, and that is what we did to observe when the eclipse was not behind enough clouds.

In 2001, I taught the same lessons to the staff at Lusaka's Chrismar hotel. No one went blind--maybe blind drunk in celebration--but no eye damage occurred. This is the alternate to aluminised Mylar.

The only country besides the United States that is terrified of eclipses is India. The country locked down as totality crossed that country in 1995. Other nations dealt with it better: I understand that the education ministry of Thailand made the eclipse a required science subject that year. India's response was very similar to the American experience in 1994.

I would also like to mention the hysterics that the British medical establishment put on in 1999. It drove Ralph Chou crazy; leading the Toronto expedition was enough for him; the British made things nearly impossible. However, the British did as they pleased; no one ran except from clouds. The rest of the Continent's media explained the eclipse and how to observe it safely.

I wonder what happened on 12 July 1684, when English colonists first observed the corona during a hybrid eclipse. Did they all hide?

I predict that in 2017, Americans will shoot guns, beat up people, torture dogs, and make a terrible racket to scare the monster away on 21 August. That is one reason why I would be in Mexico in 2024. <big sarcastic grin>

Seriously, with the attitude Evan describes, how will astronomy get its next generations of participants? --Robert B Slobins

From: Evan Zucker

I'm not so sure. When I was in Baja for the 11 July 1991 eclipse, I read a number of reports about how pregnant women in Mexico wore red underwear and stayed indoors during the eclipse to keep the eclipsed sun's rays from harming their fetuses.

And here's my favorite: as we eclipse chasers gathered on the beach that morning in front of the El Presidente Hotel at San Jose del Cabo to observe the noon-time eclipse, hotel workers erected a vertical white sheet around the perimeter of the hotel pool. I asked somebody why they were doing that. I was told it was to make sure that nobody would accidentally see the reflection of the eclipsed sun from the surface of the pool. You can't be too careful when it comes to those deadly eclipse sunbeams!

Are you still sure you want to go to Mexico in 2017 <g>? Evan H. Zucker San Diego, California

From: Starfield Scientific

I think everyone is missing the point. We shouldn't be comparing this eclipse to others because they are all unique and have their own quirky problems depending on which countries they occur in.

Gerry talks about lunatics driving cars and the associated bad car commercials. I'm sorry but that subject belongs to another mailing list. I'm trying to prevent people from going blind and the Vanessa Carlton film clip isn't going to help.

*(Continued on page 65)*

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And if you all think that there will be warnings everywhere about how to watch the eclipse safely in Australia, think again. I spoke to the Commonwealth Department of Health & Ageing today and they said "What eclipse?" and "Maybe the Bureau of Meteorology should do something".

There are so many people I have talked to here who don't have a clue about eclipse safety and nobody is taking responsibility to warn them. It has the potential to be an absolute disaster. While the Department of Human Services in South Australia is making at least a token effort, the rest of the country isn't even aware that they are going to see anything.

If you have another look at Fred's maps you will see the partial footprint covers the entire country. Also the eclipse will occur at sunset...at a comfortable eye level. It will be difficult for anyone outside at the time not to notice that an eclipse is occurring.

Fraser Farrell in SA is doing a fantastic job trying to educate people, and I'm doing my best trying to distribute eclipse shades to the rest of the country despite the fear of litigation that seems to follow them. But the two of us can only do so much.

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At the moment all I can see is a dozen Government departments that will be less than usefull trying to pick up the pieces afterwards. Welcome to Australia!

David Finlay Starfield Scientific & Photographic Services <http://www.starfield.com.au>

From: Peter Tiedt



The same hoo-hah is happening in South Africa, and no doubt in other countries to be traversed by the eclipse.

I may be pointing out the obvious, but what happens when a country experiences a partial eclipse? These are many more times more common than totals, and the risks of eye injury are exactly the same. I did a rough check with EMapWin and found that SA (South Africa, NOT South Australia) has had partial solar eclipses about every 2 - 3 years on average. To the best of my knowledge there have never been any precautionaries trotted out in the media for these - in fact the partials are ignored by the media. (It is enough of a battle to get them interested in a total.)

Where are all the reports of eye injuries for these events? I don't recall any.

Probably means that people in general (this list excepted) just don't care about celestial phenomena and won't even bother to look. Those who are showing interest and taking the opportunity, and who will be observing (partiality or totality) will ensure that they are educated.

The others don't care, and won't be looking anyway. Flame Shield Is UP!. Peter

From: Gerard M Foley

Of course, billions of people every day look at the unclipsed sun without eye damage. We have a natural reflex which makes it very difficult to bring the image of the sun near the center of the retina.

I think the danger during eclipse is much overrated, although of course in partial there is a reason to look at the sun which does not exist at other times.

I don't look at the partial phases without eye protection, and neither should you, but I think we go too far in frightening people. Gerry

From: Robert B Slobins

Evan-- The 2017 eclipse goes through the USA, exclusively. Dr Menzel did not do too badly in Oaxaca in 1970. We succeeded in 1991.

*(Continued on page 66)*

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Evan, I have lost all patience with the epidemic of arrogance and ignorance that is affecting people and nations that ought to know and act better. The funny thing is that the "Third Worlders" that we meet on these trips are eager to learn the truth about what is happening. Often, their children are more educated than the Americans. What holds these nations back is the corruption of their societies. --Robert B Slobins

From: Marc Weihrauch

Hi Gerry, I don't think so. We don't simply frighten people, we tell them "DO look, don't miss it, but for heaven's sake DO protect your eyes." So we even fight fear of eclipses - the superstitious fear - but at the same time tell the public not to become careless. I don't see what should be wrong about this. Best regards Marc

From: Robert B Slobins

Peter: ...And that is the way it should be.

Only astronomers cared about the eclipses of 1963, 1970, 1979 here in the USA in advance. The media start in about a month before, and inform the public about the dangers of unprotected solar observations. It is only when the partial eclipse is large enough when the danger occurs; the dazzle factor is reduced.

Consider other sources of sun danger. One is rush hour. People at this time of year commute at sunrise and sunset. Another is winter, when the sun is low in many locations. Sunlight reflects off of metal and glass. Do we get anything worse than car accidents caused by driving into the sun? We do not need the hysteria. --Robert B Slobins

From: Dale Ireland

Evan I was at that hotel and that is also one of my favorite stories. There was a little more to the controversy. It seems there were some public announcements that a safe way to view the eclipse was to view its reflection off of water in a pan or tub. Then there was a big argument between "experts" as to whether this was safe or dangerous. the hotel was afraid that people were planning to view the eclipse this way at the pool(certainly just a rumor)so they decided to prevent it by erecting the curtain around the pool. This included drilling dozens of holes in the tile around the pool to place posts. It was silly. They also kept most of the hotel employees inside during the event, also silly. Personally I think this entire Vanessa thread is blown out of proportion. I don't think anyone is going to stare at the sun because of the video. Dale

From: Mike Simmons

>There are so many people I have talked to here who don't have a clue about eclipse safety and nobody is taking responsibility to warn them. It has the potential to be an absolute disaster. While the Department of Human Services in South Australia is making at least a token effort, the rest of the country isn't even aware that they are going to see anything.

Where is the evidence that this could be a "disaster"? When has that ever happened before? As has been pointed out already, people look towards the Sun all the time without any evidence of damage. It isn't necessary to look directly at the Sun to have its image focused on the retina. It happens any time the Sun is in your field of view. With all the eclipses that have happened through recorded history there are very, very few reports of eye damage.

>It will be difficult for anyone outside at the time not to notice that an eclipse is occurring.

I disagree. What is this based on? I doubt anyone will notice anything happening with the Sun with anything less than a 95% partial eclipse. People just don't look up at the Sun like that. Most people don't even notice lunar eclipses where the object is easy to look at.

>Fraser Farrell in SA is doing a fantastic job trying to educate people, and I'm doing my best trying to distribute eclipse shades to the rest of the country despite the fear of litigation that seems to follow them. But the two of us can only do so much.

*(Continued on page 67)*

Good for you! But it sounds like you're also feeding the eclipse hysteria that results in people missing the eclipse altogether because of the danger. Mike Simmons

From: Klipsi

well, I certainly would, if Vanessa was to stand in front of the Sun :- ) cute babe ! Klipsi

From: Assoc Prof J R Huddle

With respect to the Vanessa Carlton "Ordinary Day" video:

I think we're making too much of this. Sure, it depicts behavior that can put one's vision at risk. It also shows people "pitching woo" during totality, which behavior I have never observed in real life. But the question is what to do about it? Given the life-span of most popular music these days, this video may be gone and forgotten by eclipse time.

Has anyone talked to newspaper reporters (NOT editors) in Australia and in southern Africa? Back in 1994, we had an annular eclipse that was visible from parts of the USA - it was partial here in Annapolis, Maryland. I called a reporter at the local paper who had written a number of science articles I had enjoyed reading. I told him: You know, there's going to be this cool solar eclipse, and I've watched a number of them, and if you'd like some info, I'd be glad to help.... When he asked me about safety, I told him what I know. Later, he called me up with questions about something he'd gotten from some ophthalmological organization that refuted what I'd told him, and we talked some more, in person. I gave him a couple pair of Mark's finest eclipse shades, and we looked at some sunspots together. In the end, he put together a fair, balanced and informative article, in which he pointed out that this ophthalmological organization recommended using only the pinhole method, but that veteran eclipse chasers had been using eclipse shades and welder's glass (Number 14, only!) for years, and so on. And the ending of this story is that nobody in Anapolis got hurt, and nobody got sued.

From: Starfield Scientific

>Where is the evidence that this could be a "disaster"?

Surely I don't have to wait until we produce several hundred fresh cases of blindness after this eclipse to prove its dangers.

>With all the eclipses that have happened through recorded history there are very, very few reports of eye damage.

1959 TSE over Australia had 170 reported cases of eclipse blindness, with half of those being school children. Is 170 enough for one eclipse or would you like more to prove my point? I am not doing all this to create "eclipse hysteria" or to scare people into buying Eclipse Shades (it would have the reverse effect anyway). I am basing these assumptions on local historical evidence. We do not have any data for the 1976 eclipse because we can't find any, leading me to believe that nobody bothered to do a study.

I have met several people in Australia this year that have eclipse blindness. One was a lady who watched the 1976 TSE...she had no idea of the dangers because there were no public warnings. She now has a big group of black spots on her vision, in both eyes.

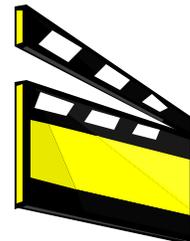
The other person was a gentleman who watched the 1945 eclipse through a pinhole as a child. He is completely blind in his right eye, and the outside surface of his eye is hard-boiled like an egg.

I will repeat what I said before because I don't think anyone has understood its implications...

This eclipse will occur at sunset for most of the country. People will not have to look up to see it. It will be at a comfortable eye level. They could be doing the gardening, walking the dog, or driving home...it will be extremely difficult not to notice. Given that the heavily populated areas of NSW, Vic, Tas, NT, WA, and SA will see 50-90% of the sun eclipsed, and having the glare reduced somewhat by the thicker atmosphere on the horizon, I would be more surprised if people didn't stare at it.

Also, Australia is in the grips of the worst drought for 100 years. The chances of there being cloud, even on the horizon, are much less than normal.

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Whether people agree with this or not is irrelevant. If it appears to be scare-mongering on my part I don't care. I don't want a single person to damage their eyesight during this eclipse.

This is the first time that Eclipse Shades have been sold in Australia on such a large scale. I am hoping that along with some sensible public education we can avoid the same things happening as before.

I do realise that I can't just walk around indiscriminately telling people that they are all going to go blind. The eclipse should be enjoyed for the wonderful spectacle that it is. I am trying to educate people with the facts about eclipse safety and to provide them with safe solar viewing material. If I scare them with the fried-eye story in the process then so be it...it scared the hell out of me.

I apologise (especially to Mike) for the way this letter sounds but there is no way to sugar-coat 170 people damaging their eyesight. Given the lack of action by Government departments outside of SA I can't see any reason why this won't happen again.

If you see me in Ceduna on Dec 4th I will probably be having the most fun out of the estimated 25,000 people there. But if I see Vanessa Carlton or someone from A&M Records I will have them lynched on the spot. What they have done in their film clip is blatant negligence. I have already talked to about a dozen teenagers who have told me they can stare at the eclipse because Vanessa Carlton does, so it must be ok. I agree with Fraser, someone should sue them for all they're worth.

Having said all this and trying hard to make my point clear, I don't believe any more needs to be said. I'd rather sit back here in the corner and listen to all the good things about eclipses that get posted on the SEML.

Regards David Finlay Starfield Scientific & Photographic Services <http://www.starfield.com.au>

From: Evan Zucker

I'm no expert, but from what I've read about eclipse blindness I had thought that the result was not black spots but, rather, blind spots. This is caused by the solar radiation killing the cells in a portion of the retina. The effect is supposed to be similar to, but more extensive than, the blind spot everybody has where the optic nerve leaves the retina.

Here are a couple of experiments that allow you to perceive your blind spot:

<http://www.univ.trieste.it/~brain/NeuroBiol/Neuroscienze%20per%20tutti/chvision.html>

[http://nebula.physics.uakron.edu/~light/the\\_eye/blind\\_spot/blind\\_spot.html](http://nebula.physics.uakron.edu/~light/the_eye/blind_spot/blind_spot.html) Evan H. Zucker San Diego, California

From: Claire Flanagan

Dave Do you have a reference to some sort of official report about this?

Regards Claire

From: Claire Flanagan

Sorry, that should have been signed off:

Claire Johannesburg Planetarium South Africa

From: Starfield Scientific

Evan, You are correct. That is how the lady described the problem to me. I should have worded my statement differently. If she stares directly at things they disappear. David



(Continued on page 69)

From: Starfield Scientific

Claire, I do indeed have a reference (printed below). It is a newspaper reference to a report conducted by a Dr James Flynn.

I have attempted to confirm the details with the Royal Australian College of Ophthalmologists however their number listed in the white pages does not work. I have some contacts with the Commonwealth Department of Health so I am attempting to contact RACO through them.

Considering the two people I met back in June with eclipse blindness I have no reason to doubt the figures. I met them at an Astronomy festival in North Sydney. I had a display set up to sell Eclipse Shades and educate people about the eclipse, so I am assuming that is why they told me about their eyesight damage. We had roughly 1,000 people talk to us during the day.

If I had a stall selling telescopes I am sure I never would have found out they had eclipse blindness.

The lady with eclipse blindness told me she stared at the sun for about half an hour. That's a bit different to the 10 seconds described below, but I'm sure people were reluctant to admit if they stared at the sun for a very long period.

Typically I do not trust everything printed in the papers, but I have no reason to doubt the accuracy of this article. Anyone is welcome to try to prove it incorrect.

I am curious as to how many eclipses are followed by detailed studies into eclipse blindness. If an ophthalmologist detected retina damage of this type would they be able to relate it back to the patient watching an eclipse? Would the patient know that was how they received the damage? I talked to my local ophthalmologist and he just stared blankly back at me when I talked to him about it. In fact he got upset with me because I was telling him something that he obviously should have known about.

I wouldn't be surprised if the reason we have all thought that eclipse blindness is rare (before the days of Eclipse Shades) is because nobody bothered to find out. At least this may be true in those countries that didn't bother about warnings. If nobody had the responsibility to warn the public, why would they bother to do a study too?

You would think that being a relatively modern country Australia would be better than this.

Regards David Finlay <http://www.starfield.com.au>

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The ASSA (Astronomical Society of South Australia) reported in their March 1960 newsletter:

For the benefit of the uninitiated we repeat - never observe the sun with unprotected eyes.

The danger is so real that we reprint the following news item, which appeared in "the News", January 19, 1960: "A total of 170 Australians, mainly schoolchildren, suffered eye injuries by watching the eclipse of the sun on April 8th last year. Many permanently damaged both eyes through looking directly at the eclipse.

Dr. James Flynn, of Sydney, reports this in the latest issue of the Medical Journal of Australia. Dr. Flynn said 40% of the patients who suffered eye injuries said they had glanced at the sun for about 10 seconds. The damage was due to the sun burning the most important part of the retina."

From: Claire Flanagan

The article seems to be "Retinal Burns after Sun's Eclipse, April 1959" from Trans Ophthalmol 53: 90 - 96 (1960).

I can't find the full article on the internet, just references to it.

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From: KCStarguy@aol.com

I am reading this thread with great interest.

I wanted to observe the partial eclipse of the 1963 eclipse (could not get to main - I was 13 years old).

I set up a direct imaging system inside a box that was completely safe. However my mother looks at when I started to use it took it away as I remember as she thought it was not safe.

I don't remember exactly but I still watched it somehow. What was funny is at that time I thought I might be able to view the new moon before it eclipsed the sun . I don't think so !!!!!

Anyway, how school in the Northwest neve showed the schools kids the grandeur of the solar total eclipse because they were afraid of bing sued. I still have all the newspaper clippings that I collected after coming back from near Winnipeg for my 3 rd total.

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From: Glenn Schneider

No public warnings?

I find this an amazing distortion of history. See:

[http://nicmosis.as.arizona.edu:8000/ECLIPSE\\_WEB/ECLIPSE\\_76/ECLIPSE\\_76\\_SCARE.html](http://nicmosis.as.arizona.edu:8000/ECLIPSE_WEB/ECLIPSE_76/ECLIPSE_76_SCARE.html)

Are your sure those spots were not in here eyes BEFORE the eclipse? It seems to me it is the only way she could have MISSED the over-blown and prolific public "warnings". -GS-

From: Evan Zucker

>I wanted to observe the partial eclipse of the 1963 eclipse (could not get to main - I was 13 years old).

>I set up a direct imaging system inside a box that was completely safe. However my mother looks at when I started to use it took it away as I remember as she thought it was not safe.

I had a similar experience, although I wasn't as well equipped with a pinhole projector as you were. I was only 8 and was in upstate New York. It was a partly cloudy day, and so I was able to see the crescent sun through the clouds. My mother saw me looking and immediately locked me in the house.

>Anyway, how school in the Northwest neve showed the schools kids the grandeur of the solar total eclipse because they were afraid of bing sued.

It's really sad. When I flew to Springfield, IL to observe the 10 May 94 annular eclipse, there was only a single group of school children at our site because they had gotten special permission from the school. I offered to let them look through my filter-equipped telescope. Their teacher said they were not allowed to -- they could only use their pinhole projectors. At least they got to use those; all the other kids were locked indoors. -- EVAN

From: F.Podmore

Sorry folks, but I deleted the messages about that video, and now someone here would like to see it - Can someone post again where the video (or parts of it) can be seen online? Many thanks.

The question: Can someone tell me HOW LONG (in km) is the eclipse track for 4 Dec 2002, and the START and FINISH times (in UT) so I can find an average speed. Is there an easy (or not too difficult) formula to calculate the speed of the umbra at any point along the centreline? Thanks very much, Francis

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From: FRED ESPENAK

The total eclipse begins in the South Atlantic where the Moon's umbral shadow first touches down on Earth at 05:50 UT. The umbra leaves Earth's surface at the sunset terminator at 09:12 UT. Over the course of 3 hours and 22 minutes, the Moon's umbra travels along a path approximately 12,000 kilometers long and covering 0.14% of Earth's surface area.

You can find other details about the extreme limits of the eclipse path at:  
<http://sunearth.gsfc.nasa.gov/eclipse/TSE2002/TSE2002tab/TP2002-Tab02.html>

I know of no simple formula to calculate the umbra's velocity at any point along the eclipse path. However, a table is available which give's the shadow's velocity at 5 minute increments along the entire path:

<http://sunearth.gsfc.nasa.gov/eclipse/TSE2002/TSE2002tab/TP2002-Tab04.html>

Other tables maps and info about the 2002 ec 04 eclipse can be found at:

<http://sunearth.gsfc.nasa.gov/eclipse/TSE2002/TSE2002.html>

The complete NASA bulletin for the 2002 total eclipse is also on the web at:

<http://umbra.nascom.nasa.gov/eclipse/021204/rp.html> - Fred Espenak

From: Dave Schmahl

If you go to <http://launch.yahoo.com/artist/videos.asp?artistID=1097970> you can watch the "Ordinary Day" video online.

From: Peter Tiedt

Francis You can calculate the umbral velocity along the ground with the classic

velocity = distance / time.

So, if you have the co-ordinates of two points of the central line on the earth's surface, and the time of maximum eclipse at each of those points, then all you need is the distance between those points.

I have used the following to calculate the great circle distance between these points...

Reference: The Satellite Experimenters Handbook, published by the ARRL

distance between two points on a GC arc:

$$s = Rb \quad (1)$$

where

s = distance in same units as R

R = Radius of earth (say in km)

b = central angle at geocenter in radians

$$\cos b = \sin \text{Lat1} \sin \text{Lat2} + \cos \text{Lat1} \cos \text{Lat2} \cos (\text{Long1} - \text{Long2}) \quad (2)$$

sign conventions: Latitude N = +ve, Latitude s = -ve; Longitude E = +ve, Longitude W = -ve.

If you want the azimuth between the points, then



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$\cos A = (\sin \text{Lat}2 - \sin \text{Lat}1 \cos b) / (\cos \text{Lat}1 \sin b)$  (3)

where A= Azimuth of point 2 from point 1

If (Long1 - Long2) is not in the range -180 to +180, then add or subtract 360 deg to bring it into range.

If the adjusted value of Long1 - Long2 is -ve or zero, then true Az is given by A If positive, then true azimuth is given by (360-A) Hope that helps Peter

From: Joseph Cali

Instead of calling ourselves an eclipse chaser, perhaps we could label ourselves as an eclipse chaseer<g>

Francis : The ground speed of the Moon's shadow when it crosses the Australian coast at Ceduna From Fred's table is about 2000 km per hour The shadow crosses the 780km of outback to the Sturt National park in only 1 min 20 seconds. The shadow travels the last 300km between Lydhurst and Fort Grey in just 17 seconds at an average speed of approximately 63000km per hour.

We have chartered two aircraft for the day to take the group to clear sky in case of cloud from our site at the end of track. Someone suggested that we go up in the planes during the eclipse and track the shadow to get a longer eclipse. At maximum speed of 350km per hour, we would see an eclipse that was only a tenth of a second longer from the planes. Probably less given that the shadow speed above our site is much greater than 63000 average speed over the last 300km of track.

From: Joel Moskowitz

Hi Joe, The usual experience of the shadow rushing in evidently will be "greatly" enhanced.

### What else to do in the RSA ...

From: Daniel Fischer To: SOLARECLIPSES@AULA.COM Date: Wed, 30 Oct 2002 21:12:56

... other than watching 1 1/2 minutes of eclipse? For my own travel group I recently compiled many recommendations from several travel guide books for the extreme northeast of South Africa - the quotations are in German but most links are to English-language sites and the maps are clear anyway: <http://www.astro.uni-bonn.de/~dfischer/2002>

I would appreciate comments on important sights in the area south and east of Jo'burg that I have missed. The biggest mystery to me happens to be the Nwandei National Park, by the way: fully inside the zone of totality and apparently developed - but I just couldn't find anything on the web ... Daniel

From: Michael Gill

Daniel, Peter Hers has posted a web page about his eclipse-scouting trip that he undertook in December 2001.

<http://home.mweb.co.za/zs/zs6phd/eclipse.htm#recon>

He has a reference to the Nwandei Nature Reserve on this page: [http://home.mweb.co.za/zs/zs6phd/eclipse\\_1.htm](http://home.mweb.co.za/zs/zs6phd/eclipse_1.htm)

There are a few photographs of the park at this link: [http://www.wilddog.co.za/dzata/body\\_attractions.html](http://www.wilddog.co.za/dzata/body_attractions.html) Hope this helps. Michael Gill



**Dec 4, 2002 TSE Timeline**

From: Rybrks1@cs.com To: SOLARECLIPSES@AULA.COM Date: Thu, 17 Oct 2002 12:43:19

For anyone so inclined, I can forward an MSWord.doc copy of this timeline to you off-forum. It will appear considerably cleaner and more legible in that format with proper spacing and tab columniation. Please make your request also off-forum to: rybrks1@cs.com I recommend maximizing your screen width to read it presently as email.

What follows is a detailed descriptive timeline for your enjoyment of the December 4, 2002 total solar eclipse. Although in spots it employs four different perspectives, basically all of the timeline applies no matter where on Earth your site is located. Although the times listed are for South Australia, by setting a watch to UTC plus 10.5 hours the times listed can be followed in real time on eclipse day wherever you are situated. The approximate position of partial phases on the face of the Sun at various sites is described using the face of a clock, it is simply easier to envision. That technique is not meant to replace detailed points of contact conventionally shown as degrees CCW from vertical, etc. except the first contact for Koolymilka which is listed CW not CCW. For exact contact points see the NASA/TP - 2001 - 209990, Espenak and Anderson or I can provide data for unlisted sites on request.

The four perspectives:

- 1) Solar viewpoint - as if you were standing on the Sun with a nice warm telescope watching the Moon approach Earth.
- 2) Earth night-half or back side - salient locations and particular data if the shadow cone could laser through a clear glass Earth to the night side of Earth. This rear path would start off the African west coast at the same point the shadow contacts Earth on the normal path but instead it would go north and cross the Equator midway between the closest points of west Africa and east S. America, transition to annular shortly after crossing the equator, run roughly parallel to the northeast coast of S. America and make landfall on the coast at the Venezuela/Guyana border. Then continue as annular through northern Venezuela and Colombia, run for only 1 minute across a 70 mile stretch of extreme southern Caribbean Sea and cross southern Panama into the Pacific at over 1 mile per second. Again water based, pass 60 miles south of the Panama Canal and continue along the Pacific as an annular, reverting back to a total eclipse near Samoa in the southwest Pacific and end in the Australia desert with the normal path. Differential speeds are very high because the back half of Earth is moving opposite to the direction of the Moon.
- 3) Local ground view - how the shadow footprint would appear beneath our feet viewed from Koolymilka through a clear Earth. It helps to have a clear beach ball globe of the Earth with Koolymilka positioned on top to understand the perspective. We would see a stretched shadow ellipse as it lands on Earth and see it grow wider but shorter. At first this shortening is due to the initial stretch contracting after it lands, then as it comes closer to us over the next 4.3 hours, approaching our horizon, the shortening is due to "perspective foreshortening" as we view it more "edge on". I list the location of the shadow footprint in degrees to the left of the Sun for that time, degrees below the horizon, distance overland to the shadow center and apparent size of shadow width. This listing appears as smaller italics above the event.
- 4) Local sky - what we will see in the night sky at Koolymilka before sunrise on eclipse day and what we could see in the day sky if the Moon, planets etc. were visible. The reason I picked Australia over Africa as the local spot is because Africa is a morning eclipse and after totality almost the entire day is spent ignoring the Sun and reminiscing over the eclipse, as well it should be. For afternoon eclipses like Australia, the day is spent in anticipation of the eclipse so a timeline has more utilitarian value for pm eclipses.

**TIMELINE**

Times are local Koolymilka, ASDT South Australia Daylight Savings (UT plus 10.5 hours)

Local Events are at: South 30 degrees 56' 34.08" East 136 degrees 31' 34.62"

This site happens to be 0.89 miles (north) perpendicular to centerline (coordinates courtesy of Fraser Farrell) Centerline results of EclComplete (same delta T) are 1.07 miles south (perpendicular) of data in NASA/TP.

December 1, 2002 11:45 ASDT Earth and Sun lined with Moon's descending node. Since eclipse occurs over 3 days later when the Sun is about 3 degrees left of the node, the path will have a negative gamma, - 0.302.

(Continued on page 74)

DECEMBER 4, 2002

TIME Local Sky Event

HH:MM:SS.ss

00:07 Neptune sets (moving left) in the WSW  
 00:21 Seven Sisters (Pleiades) transit moving left, 35 deg alt due north  
 00:34 Jupiter rises (moving left) ENE, Magnitude minus 2.3  
 01:02 Uranus sets in the WSW. Magnitude +5.9  
 01:09 Regulus rises ENE

01:13:42.95 Local midnight Koolymilka precisely (at listed coordinates) The Horns of Taurus transit (the background of the eclipse), this is the eclipse-line point projected out the celestial sphere directly behind the Moon/Earth as seen from the Sun at Greatest Eclipse.

Local sky: Sun due south, 36.9 deg below horizon

02:00 Large Cloud of Magellan transits, 52 deg alt due south  
 02:20 Saturn and Orion transit, 37 & 61 deg alt due north  
 04:02 Mars rises EESE, Magnitude +1.7  
 04:10 Venus rises EESE, (Mars/Venus osculate Dec 6 at 06:06 UTC, minimum separation 1.6 degrees)  
 05:53:00 Moon rises, azimuth 114 deg, (not visible) 05:57 Jupiter transits, 43 degrees alt due north 06:12:50 Sun rises, azimuth 117 deg, Local sky: Moon is 4.5 degrees to the left of the Sun and 3 degrees above it, Moon appears to left of Sun all day

06:22 Horns of Taurus set, (the background of the eclipse), Azimuth 296 degrees. See note at time 15:21 below.

Sun's view

07:00 Center of umbra 20,826 miles (2.5 Earth diameters) from first contact, U1  
 Leading edge of penumbra 18,693 miles from first contact, P1

Local sky

10:32 Mars transits moving right to left, 70 degrees altitude due north  
 10:39 Venus transits moving right to left, 70 degrees altitude due north.

This is visible since Venus is Magnitude minus 4.7

Sun's view

12:41 Moon at descending node, all three bodies in ecliptic plane.  
 Center of umbra 8,121 miles from limb of Earth  
 Moon moving its own diameter every 58 minutes.

Local sky view

13:00 Moon same altitude as Sun, 2.7 degrees left of Sun  
 Moon quickly swings CCW around Sun near local noon

Local sky

13:01:40 Moon transits, moving right to left, 81 degrees altitude due north

13:13:54.93 Local noon Koolymilka precisely (at listed coordinates) Sun due north moving to the left, altitude 81.3 degrees

14:00 Mercury transits moving right to left, 84 degrees altitude due north

Sun's view

14:00 Center of umbra 5,171 miles (over 1 Earth diameter) from first



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contact, U1  
Leading edge of penumbra 3,035 miles from first contact, P1

Umbra Approaches Earth

Sun's view

15:20:52.3 Edge of Penumbra vertically aligned with limb of Earth. Only 30.3 seconds before initial first contact.

With the length of the umbra cone shortening about 1.6 miles every hour and the umbra diameter shrinking 0.8 mile in diameter per hour (measured at Earth center distance), the penumbra and umbra approach their contact points on the leading limb of Earth, P1 and U1.

The umbra cone is decreasing in length because Moon is moving toward the Sun at 626 mph (Earth/Moon system is moving toward the Sun at 550 mph and the Moon is receding from Earth at 76 mph.)

Looking from the Sun, the Moon would approach Earth moving to the right between the horns of Taurus the Bull, quite close to the north horn of the Bull. Looking at a star chart where the ecliptic line passes through the north horn, that is where the Earth and Moon would appear from the Sun's viewpoint. The Moon would have a brightness of plus 0.4 magnitude viewed from the distance of the Sun, Earth would be roughly magnitude minus 3.3, depending on actual cloudiness of day-side facing the Sun. The Moon appears very close to Earth at the distance of the Sun, (it never exceeds more than 9 arc-minutes separation during a quarter-moon phase.)

ECLIPSE BEGINS

Ground view from Kooly (15 deg left of sun, 59 deg down, 8108 miles away, no footprint yet)

P1 15:21:22.6 1.95 N At, 15.45 E Long. 395 miles inland from African west Atlantic coast. 205 miles northwest of the mighty Congo River on the border of Cameroon and the Congo. First opportunity on Earth to see partially eclipsed sun - moon bites top of sun at local sunrise. This can actually be seen almost a degree west (about 61 miles west-northwest) of the site indicated in the NASA TP (for a standard atmosphere) due to refraction. For the site indicated, the Sun would simply be about 1.8 diameters above the horizon. If we included non-forecastable atmospheric conditions that can create the green flash effect, then the very farthest location to the west that could witness initial first contact would be as much as another 4 miles west and a bit sooner. But basically everyone along a line from the TP site to that max west point would see contact at nearly the same time - the farthest point west perhaps witnessing contact up to 4 seconds sooner, depending on specific refraction effects. These refractive effects apply to all external and internal contacts. These eight contacts points and times are provided courtesy of NASA/TP - 2001 - 209990, Espenak and Anderson.

The penumbra is 4,311 miles in diameter at time of P1 and is expanding almost a mile every hour. Moving across Earth toward the subsolar point, although it is expanding the effective diameter is reduced by 38 miles at that point because the bulge of the Earth truncates the penumbra cone.

15:23:06 First contact on Island of Sao Tome, 200 miles west of Africa coast

15:23:09.5 Sun View The front (slightly lower edge) of penumbra traveling down at 5 degree slope intersects limb of Earth. First contact sunrise at -3.93 S At, 12.62 E Long

15:31:30 Extreme easterly longitude experiences first contact at sunrise . 14.78 N, 18.32 east, in Chad, Africa

15:32:48 First contact Uhuru Peak, Mt. Kilimanjaro. Occurs five seconds sooner than at bottom of mountain. Bite appears on the 12:30-o'clock-spot on face of Sun. Alt 25 deg

15:34:54 First contact Victoria Falls, Zimbabwe. Bite appears on the 11:00-o'clock-spot on face of Sun. Altitude 20 degrees.

15:47:35 First contact Johannesburg, SA. Bite appears on the 10:00-o'clock-spot on face of Sun. Altitude 27 degrees.

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15:52:28 First contact, Antananarivo, Madagascar. Bite appears on the 11:30-o'clock-spot on face of Sun. Altitude 44 degrees.

16:02:11 First contact, Capetown, S Africa. Bite appears on the 9:20-o'clock-spot on face of Sun. Altitude 23 degrees.

16:08:33 Northern Limit starts. 24.85 N At, 13.8 E Long This is a mathematical event. It is not the most northerly latitude for C1. It is when the radius of the penumbra is initially tangent to the limb of Earth (or perpendicular to the radius of Earth.) This contact occurs at sunrise in the middle of nowhere, in the Sahara in Libya.

16:15:34 Another mathematical event. Sun's view. Lateral axis of penumbra (inclined 5 degrees CW from vertical) tangent to Earth. Since by definition it is perpendicular to radius of Earth, the bite out of the Sun must be directly on the side of Sun (3 o'clock-spot). This happens to be at 0.462 magnitude, sunrise, 11.95 N, 6.1 E Long. Max partial magnitudes can now begin to be a function of penumbral passage as opposed to late sunrise for a site.

16:18:27 Sun View. Center of Moon vertically aligned with left limb of Earth.

16:18:49 Extreme northerly latitude contact (sunrise). 25.28 N At, 11.4 E Long Still in the middle of nowhere in the Sahara. Also physically higher above ecliptic plane than event at 16:08:33 UTC. How can there be a more northerly latitude site ten minutes after the North Limit starts? Because that event was the tangent and not really (in my view) the start of N Limit. I consider this event the start of 0 % Penumbral N Limit since it is the time and place where the penumbra bandwidth, inclined at 5.28 degree slope, intersects the limb of Earth. These definitions are semantically debatable since the 46.2% N Limit clearly started over three minutes ago.

Ground view from Kooly (34 deg left of sun, 64 deg down, 8781 miles away, only point at first) 16:20:19.2 Umbra leading edge lands on Earth, followed over the next 29.2 seconds with northern umbra edge, center of umbra, southern edge and finally the trailing edge of the umbra. See NASA/TP - 2001 - 209990, page 56, Table 2 for times. Ground view from Kooly (Once the shadow is fully landed it would appear 0.2 deg x 2.0 deg through Earth to our eyes.)

16:22:36 Earth back half, fictitious shadow would cross Equator through a clear Earth. Standing on Equator at night looking 11 degree below horizon, azimuth 113 one would see a fictitious total eclipse. Duration 13.8 secs, shadow shape 9.9 x 51.5 miles Location: Latitude Zero Deg, Long West 12.6 In Atlantic Ocean, south of Liberia, Africa.

16:25:42 Umbra makes landfall at Angola, Totality begins on west coast of Africa, duration 49 seconds The entire fifteen miles of coast that are in totality enjoyed 4 mins 35 seconds of centerline totality 18 months ago on June 21, 2001. That path covered almost 4 times as much coastline as this 2002 path.

16:28:36 Maximum magnitude Uhuru Peak, Mt. Kilimanjaro. Bite appears on the 2:30-o'clock-spot on face of Sun, alt 37 deg.

16:32:36 Earth back half, fictitious shadow would transition to annular through a clear Earth. Location: Latitude North 4.49 Deg, Long West 30.39 Standing at this site at night looking 27 degrees below horizon, azimuth 113 one could see a fictitious annular eclipse. In Atlantic midway between S America and Africa.

16:34:30 Umbra enters western Zambia. Duration 1:04

16:36:30 Umbra enters Namibia's eastern finger of land wedged between Zambia and Botsawana. Shadow imprint is just large enough to cover the width of this thin strip of property. Duration 1:04

16:37:38 Umbra enters Botswana. Duration 1:10

16:38:59 Maximum eclipse Victoria Falls, magnitude 98%. Huge bite appears on the 2:00-o'clock-spot on face of Sun. Altitude 34 degrees

16:39:50 Umbra enters Zimbabwe and dances left and right of the meandering Botswana/Zimbabwe border for the next ten minutes.

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16:47 Umbra enters South Africa. Duration 1:22

Ground view from Kooly (24 deg left of sun, 47 deg down, 6490 miles away, 0.4 degrees apparent size)

16:51 Umbra enters Mozambique. Duration 1:27

16:53:33 Max eclipse Johannesburg, SA. Bite appears on the 8:00-o'clock-spot on face of Sun. Altitude 41 degrees.

16:58 Trailing edge of umbra leaves Africa and is fully upon Indian Ocean.

16:59:15 Earth back half, fictitious shadow would make landfall on South America through a clear Earth. Standing at this site at night looking 49 degrees below horizon, azimuth 115 one could see a fictitious annular eclipse. Duration 11.5 seconds. Shadow shape 9.9 x 13.1 miles Durations use larger k value for annular events. Location: Venezuela / Guyana border on the Atlantic coast.

Ground view from Kooly (23 deg left of sun, 43 deg down, 5924 miles away, 0.5 degrees apparent size)

16:59:28 Maximum eclipse Capetown, magnitude 59%. Bite appears on the 7:00-o'clock-spot on face of Sun. Altitude 35 degrees

Local sky

17:07 Venus sets moving right to left, azimuth 257

17:09:58 Southern Limit begins, first opportunity on Earth to see ecliptic bottom of Moon graze the top of the Sun. South Atlantic. Because the south penumbra for this eclipse expands through the magnitude 1.000 line (south limit of centerline) this event represents an unambiguous start of penumbra south limit. Because P1 occurred in the north half of the penumbra and expanded both north and south, drawing a north tangent only there made sense (at time 16:08.)

17:11:42 First contact on Island Saint-Paul, FSAT (French Southern and Antarctic Territories) Midway between Africa and Australia. Bite appears on the 8:30-o'clock-spot on face of Sun.

17:16:30 Extreme westerly longitude to witness last contact at sunrise, -39.15S, 33.53W, South Atlantic Ocean

17:22:00 Back of Earth; shadow cone through a clear Earth would exit 60 miles south of the Panama Canal. Sitting in a row boat here at night looking 61 deg below horizon, azimuth 123 one could see a fictitious annular eclipse duration 16.6 seconds. Shadow shape 14.7 x 16.8 miles, 3619 mph

P2, 17:25:13.6 Last opportunity on Earth to witness last contact at sunrise, C4. Occurs in South Atlantic, 460 miles SSE of the island of Trindade owned by Brazil

17:26:00 First contact on Antarctica, tip of Cape Ann. Bite appears on the 7:30-o'clock-spot on face of Sun. Alt 45 deg, azimuth 26

Ground view from Kooly (22 deg left of sun, 36 deg down, 5040 miles away, 0.6 degrees apparent size)

17:31:24 Last contact Uhuru Peak, Mt. Kilimanjaro. Bite appears on the 4:30-o'clock-spot on face of Sun.

17:31:44 Last contact Angola Atlantic coast.

17:51:56 Last contact Victoria Falls, Zimbabwe. Bite appears on the 5:00-o'clock-spot on face of Sun. Altitude 51 degrees

The following 4 underlined events occur in Indian Ocean, the shadow having traveled less than halfway from Africa to Australia, about 650 miles northwest of the Crozet Islands.

M\* 17:57:38 greatest magnitude, occurs before reaching bulge of Earth due to receding Moon

Moon assumes largest size ratio relative to Sun Latitude 38.93 South, Longitude 58.07 East 2m 3.64s, Duration 0.14 seconds

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shorter than G0

G\* 18:01:10.9 Latitude 39.47 South, Longitude 59.57 East Instant of greatest eclipse, umbra footprint is least elliptical, closest to Earth's center.

Fictitious eclipse out the back of Earth would be annular duration 19.8 seconds, 72 degrees below horizon azimuth 168.

D\* 18:02:18 Maximum Duration -39.49, 59.62 east, 0.012 seconds longer than G\* Shadow can encompass both sites G\* and D simultaneously. Smaller hour angle reduces relative velocity with site, increasing duration.

18:02:33 Last contact, Capetown. Bite appears on the 5:00-o'clock-spot on face of Sun. Altitude 48 degrees

18:04:21 New Moon. Sun and Moon same ecliptic longitude.

18:08:10 Last contact Johannesburg, SA. Bite at the 5:00-o'clock-spot on Sun. Altitude 58 degrees.

Noon\* 18:08:44.4 Mid eclipse at local noon Lat. 40.54 South, Longitude 62.85 East. Sun and Moon same Right Ascension

18:28:11 First contact, Perth, Australia. Bite appears on the 7:00-o'clock-spot on face of Sun. Altitude 38 degrees.

18:28:24 Extreme southerly latitude extent of the South Limit. 350 miles from South Pole. Midway between the Pole and Vostok Station.

18:28:37 Last contact, Antananarivo, Madagascar. Bite appears on the 5:00-o'clock-spot on face of Sun. Altitude 80 degrees.

Ground view from Kooly (18 deg left of sun, 26 deg down, 3521 miles away, 0.8 degrees apparent size)

P3, 18:36:56.4 First opportunity at sunset to witness first contact, C1. Occurs 200 miles west of the Antipodes Islands (NZ)

18:38:18 Maximum magnitude on Island Saint-Paul, FSAT (French Southern and Antarctic Territories). Magn 0.87 Huge bite out of 10-o'clock-spot on face of Sun. Path of totality skirts between the Kerguelen and St. Paul Islands. Saint-Paul is 800 miles NNE of Kerguelen.

18:39:37 First contact in Adelaide, Southern Australia (AS) Hard to believe Adelaide (east of Ceduna) sees first contact before Ceduna, but it does. Adelaide is lower (south) so it is closer to the leading edge bump of the penumbra.

18:40:17 First contact in Ceduna, Southern Australia (AS)

18:42:15 First contact in Koolymilka, Southern Australia (AS). 202 degrees CW from vertical, 85.3 CW from north (Bite appears approx on the 7:00-o'clock-spot on face of Sun) Sun altitude 17.7 degrees, azimuth 254.2

18:45:31 First contact in Brisbane, Southern Australia (AS)

18:52:26 Southern Limit ends 500 miles north of Antarctica, 1500 miles south of New Zealand.

19:00:00 Ground view from Kooly (13 deg left of sun, 19 deg down, 2562 miles away, 1.0 degrees apparent size)

Put on eye patches

19:15:00 Ground view from Kooly (12 deg left of sun, 15 deg down, 2075 miles away, 1.1 degrees apparent size)

19:30:00 Ground view from Kooly (9 deg left of sun, 9 deg down, 1293 miles away, 1.4 degrees apparent size)

19:36:38 Maximum magnitude In Perth, Australia. Bite appears on the 10:00-o'clock-spot on face of Sun. Alt 24 deg.

(Continued on page 79)

Start looking for corona.

19:37:00 Ground view from Kooly (6 deg left of sun, 5 deg down, 702 miles away - shadow will be upon Koolymilka in under 4 minutes, 2.3 degrees apparent size)

19:39:56 One minute to go. Shadow center 294 miles away. Front edge 234 miles away. Because the shadow is leaning almost all the way over toward the Sun and away from Kooly, I am curious how obvious the approach will seem. In Siberia, the Sun was up 16 degrees but we were near the north limit so the shadow seemed to sweep in front of us from right to left.

19:40:12 Totality begins Ceduna, Southern Australia (AS)

19:40:45 Totality ends Ceduna, Southern Australia (AS)

19:40:55.6 Limb corrected time, C2. Totality begins Koolymilka, Southern Australia (AS) Shadow speed is enormous - 15,812 mph. The shadow dimensions are 18.34 x 182.25 miles mideclipse. I expect the diamond at C2 to be at about the 2-o'clock-spot (upper right)

When the shadow arrives at Koolymilka its size is 19 x 161.3 miles. When it leaves it is 17.5 x 224.3

19:41:23.2 Limb corrected time, C3. Totality ends Koolymilka, Southern Australia (AS) duration 27.6 seconds with limb corrections. Kooly is so close to the sunset limb of Earth that the shadow will exit Earth only 7 seconds later. I expect the diamond at C3 to be at about the 6-o'clock-spot (bottom). The shadow shaft will still be over our heads after C3 almost parallel to the ground. In Bolivia 1994 the same was true in the morning as it approached but it was inclined 34 degrees. For this eclipse it will only be inclined 6 degrees.

19:41:30 Last contact on Antarctica. (tip of Cape Poinsett) Bite appears on the 3:00-o'clock-spot on face of Sun. Alt 27 deg.

19:41:30.3 Leading edge of umbra departs Earth followed by southern edge, then center, then north edge then finally the trailing edge, all taking only 25 seconds. See NASA/TP - 2001 - 209990, page 56, Table 2 for times. Even though the shadow is moving more slowly (0.3%) now, departure interval U3-U4, is quicker than arrival U1-U2, because the shadow is 17% smaller than it was 3.3 hours ago.

19:53:51 North Limit ends. East of Borneo in Mulucca Sea surrounded by paradisiacal islands.

20:00:42 Last contact on Island Saint-Paul, FSAT (French Southern and Antarctic Territories). Bite appears on the 12:30-o'clock-spot on face of Sun.

20:13 Koolymilka, center of Sun on horizon with a big bite missing on the top right. Sun moving right to left as it sets. Keep your fingers crossed for a double green flash.

20:34:54 Koolymilka, Sun 4.9 degrees below horizon, last contact

20:37:36 Last contact Perth, Australia. Bite appears on the 12:30-o'clock-spot on face of Sun. Altitude 11 degrees.

P4 20:41:0.6 Very last contact on Earth, in Western Australian 30 miles SW of Tabletop Mountain.

P1 minus P4 = 5hrs 19min 38sec: life span of eclipse

22:02 Jupiter stationary west.

All times calculated by Raymond Brooks, Star Engineering Event rounded to nearest full second or minute, unless shown more detailed.

(Continued on page 80)

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From: Fraser Farrell

To all, An excellent timeline by Ray, who clearly has far too much spare time! After corrections for limb profile & refraction I get slightly earlier C2 and C3; but I'm probably assuming a warmer atmosphere than Ray is....

Some timeline additions:

19:40:00 Earliest totality on Australian territory begins at Purdie Island (32d16' S 133d14' E). This island is easily visible from the coasts west of Ceduna.

19:40:03.6 Earliest totality on Australian mainland begins simultaneously at Rocky Point (32d12' S 133d15' E) and Point James (32d12' S 133d24' E); both on the coastline to the west of Ceduna. Both locales have -very- limited parking space.

19:40:04 Totality begins on the ~5km long Ocean Beach, between Point James and Point Peter (32d12' S 133d29' E).

19:40:07 Totality begins at Cape Beaufort (32d10' S 133d33' E), which is easily visible from Ceduna foreshore.

19:40:09.5 Totality begins at Thevenard (Ceduna's port).

19:40:10 Totality begins at Ceduna post office.

19:40:42 Totality ends at Ceduna post office.

19:40:43 (approximately) Celebrations begin in Ceduna.... ;-)

20:01 LOW TIDE at Ceduna. Should be plenty of beach to watch from on the day.

cheers, Fraser Farrell



**Eclipse viewers for 2003 annular**

From: Sheridan Williams

I have been asked to recommend a source of eclipse viewers for the 2003 annular visible in Scotland.

Obviously a source in Britain would be cheapest, can anyone advise please. Best wishes, Sheridan Williams

From: KidinVS@aol.com

As a friend, and a customer, I would highly recommend Mark Margolis from Rainbow Symphony. He is located in Redwood City, Calif. His phone number is 818-708-8400. His prices are competitive, his product is of the highest quality, and he is a sponsor of this SEML. Why would a person look elsewhere??? (I don't get it) He is also well known to people on this list, and he has done countless charitable acts so far as donating glasses in areas that could not afford to purchase them, as he has done in Africa in 2001, and is doing for these same people again in 2002. Rick Brown [www.eclipsesafaris.com](http://www.eclipsesafaris.com)

From: Assoc Prof J R Huddle

Perhaps of more use that a phone number, at least to those living outside the USA, the URL for Rainbow Symphony is <http://www.rainbowsymphony.com/>. There are links on that page for Eclipse Shades (TM). I found the link to the store a bit difficult to find; it is a red button labeled "BUY" near the top of the home page, on the left. As Eric points out, Rainbow produces a product of excellent quality, and Mark, the proprietor, is as avid an eclipse promoter as any of us.

There are other sources for safe solar filters, as well. Fred Espenak has listed several sources in his NASA Technical Publications on total and annular eclipses. Go to, for instance, <http://umbra.nascom.nasa.gov/eclipse/010621/text/filter-sources.html/>.

Our colleagues in the UK might be especially interested in contacting Swan Packaging Ltd., which Fred has listed as being at Unit 6, Princewood Road, Earlstrees Industrial Estate, Corby, Northants NN17 4AP UK. The telephone number is +44 (01536) 204272; Fred did not list any URL. Jim Huddle

From: Mark

Thanks All, Please note, in addition to the retail prices at our online shopping center, we do have a distributor pricing schedule which we will extend for larger quantities of generic and custom printed Eclipse Shades. Please give us a call or send an email for those prices. Thanks Mark Rainbow Symphony, Inc. <http://www.rainbowsymphony.com> Ph# 818-708-8400 Fax# 818-708-8470 Quality Paper Eyewear and Specialty Optics

**Annular eclipse of 2003 May 31**

From: Jean Meeus To: Solar Eclipses <[solareclipseswebpages@btopenworld.com](mailto:solareclipseswebpages@btopenworld.com)> Date: Sat, 12 Oct 2002 10:23:23

On pages 60-61 of the November issue of Sky & Telescope there is a review of my recent book 'More Mathematical Astronomy Morsels'.

The reviewer writes (page 61) about the 'unusual annular eclipse on May 31, 2003, in which the Moon will appear to move across the face of the Sun the "wrong" way, from left to right.'

This is incorrect, and I never said that in my book. The reviewer seems to have misunderstood my description of the 2003 eclipse, confusing the direction of the Moon's motion on the sky with the direction of motion of its shadow on the Earth's surface!

At ALL solar eclipses, the Moon is moving from West to East with respect to the Sun. Jean Meeus

**Mailing list for NASA 2003 Eclipse Bulletin**A  
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From: FRED ESPENAK To: SOLARECLIPSES@AULA.COM eclipse@hydra.carleton.ca Date: Tue, 22 Oct 2002 19:18:14

I have just finished the manuscript for the latest NASA eclipse bulletin "Annular and Total Solar Eclipses of 2003." Unlike previous bulletins which covered a single event, the 2003 bulletin will contain details for both the May 31 annular and the November 23 total eclipses. The publication will have a NASA Technical Publication number assigned to it later in the week.

The manuscript is currently undergoing final preparations for publication which will probably be in approximately 3 weeks.

If you have already sent me a self addressed and stamped envelope, then you will receive your hard copy of the bulletin by the end of November. If you have not yet pre-ordered a copy, you can find information and instructions at:

<http://sunearth.gsfc.nasa.gov/eclipse/SEpubs/bulletin.html>

The actual request/order form is at:

<http://sunearth.gsfc.nasa.gov/eclipse/SEpubs/RPrequest.html>

I will be updating my "quasi-permanent" mailing list for the bulletins during the next week. This list is for institutions, professional eclipse researchers and serious eclipse amateurs.

If you are not already on this list and you have traveled to at least three solar eclipses in the past ten years and would like to be added to the mailing list, please email me at [espenak@gsfc.nasa.gov](mailto:espenak@gsfc.nasa.gov). Include your complete postal address and a list of the eclipses you have traveled to. Thanks, Fred Espenak

From: Dale Ireland

Hello Will the entire bulletin be available on-line. i.e.; Will there be any charts, diagrams, tables, in the hard copy that are not going to be available on-line. Dale

From: FRED ESPENAK

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The entire contents of the bulletin will eventually appear online, but it might take a while since I'm depending on someone else to do this for me and he has other deadlines. I'll keep SEML advised about web access to the 2003 bulletin. - Fred



**Antarctica eclipse flight**

To: eclipse@hydra.carleton.ca Date: Sun, 13 Oct 2002 08:45:57 -0400 From: "Steve Schonberger" <steve.schonberger@lycos.com>

My wife and I are interested in the Antarctica eclipse (and just seeing Antarctica), but the tours I've been able to find so far (with web searches) are all very expensive -- over \$25000 per person. Does anyone know of any more affordable tours?

From: NinaSandy@aol.com

I believe there is a plane trip from Sydney or Perth once a week which flies over Antarctica and I believe they will do the eclipse even though it is a Thursday and not a Sunday. Sandy Sanders

From: olivier.staiger@span.ch

Qantas flight QF64 flies Johannesburg-Sydney nonstop, coming close to Antarctica.  
QF63 flies Sydney - Johannesburg coming closer, or probably overflying Antarctica.

but QF64 is a better candidate because it flies faster and thus has more margin for a little side-trip into the path of totality. Timing of QF64 is almost perfect. It leaves at 17h50 local time, 15h50 UT. The eclipse is around 22h30 UT on 60S, 90E. Flight duration is 11.45 so we are about halfway. This needs only a small correction and .... bingo ! Bad news however: jetstream position changes daily , and flights west-to-east try to catch the jetstream, to win time and fuel. If jetstream is far off Antarctica it won't happen, unless Qantas deliberately chooses to hunt for the Moon shadow .

QF63 probably flies closer to Antarctica, or over the edge. But it leaves morning in Sydney and flies all day, arriving afternoon Johannesburg. Thus it wont be over eclipse area at eclipse time. Also, the flight is scheduled to last almost 14 hours, which leaves not much margin for hanging around.

I will fly THIS coming November 23 2002 on QF64 to Sydney, and on december 9 QF63 back. Will investigate , take photos, interview captain, film, and report on <http://eclipse.span.ch/eclipse.htm> .

Klipsi P.S. cost of ticket: Qantas has very affordable around-the-world ticket, which may be one way to go for it.

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# Joanne & Patrick

*The sole Newsletter dedicated  
to Solar Eclipses*



THE SOLAR ECLIPSE NEWSLETTER IS A MONTHLY NEWSLETTER ABOUT SOLAR ECLIPSES EDITED BY PATRICK POITEVIN & JOANNE EDMONDS. FINANCIAL SUPPORT FROM THE RAINBOW SYMPHONY.



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## Corona and Coronet by Todd — expedition members 1896



EXPEDITION MEMBERS, AND OLD SCHOOLHOUSE, AFTER THE ECLIPSE